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PROFESSIONAL EARNINGS: AN ANALYSIS OF RETURNS TO WORK EFFORT, HUMAN CAPITAL INVESTMENT AND OCCUPATIONAL CHOICE

by

Stephen P. Dresch

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INSTITUTE FOR DEMOGRAPHIC AND
ECONOMIC STUDIES, INC.

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First Year Final Report

This study has been undertaken with the support of the Office of Research, Demonstrations and Statistics, Health Care Financing Administration, U.S. Department of Health and Human Services (Contract Number 500-78-0054). The present report constitutes what is, in effect, an interim final report on the first year of a two year study. The author has benefited greatly from discussions of this research at two HCFA-sponsored conferences and would also acknowledge the contributions of discussions with Jon Gabel, Ira Burney, Bill Sobaski and especially the project officers, James Cantwell and his predecessor in that role, Nancy Greenspan. The author alone is responsible for the views expressed.

Summary

This report presents the preliminary results of a study of returns to work effort, human capital investment and occupational choice. The first section develops the necessary theory, while the second is devoted to a cross-sectional analysis of returns to physician training and specialization.

Theory

The principle issue addressed in this report concerns the appropriate adjustments of interoccupational earnings differentials for associated differences in hours of work for purposes of estimating returns to occupational choice. At the outset (Section 1) it is demonstrated that hours of work adjustments require explicit attention to systematic interoccupational differences in (a) the degree of individual control over hours of work, (b) lifecycle variations in work effort, (c) preferences in the earnings-liesure space, and (d) the relationship between average and marginal wage rates (and hence variations in the marginal wage rate witn variations in hours of work). The last is indicated to be of particular importance in the analysis of professional earnings, because variations in marginal wage rates will be implied by (a) declining efficiency with increases in hours of work, (b) fixed components of earnings, (c) fixity of other inputs or nonhomogeneity of the production function, and (d) imperfectly competitive markets for professional services. On each of these counts it is demonstrated that proportional adjustments of earnings for hours

of work differentials between occupations will lead to downward biased estimates of earnings differentials.

Although not amenable to empirical implementation with available data, a generalized lifecycle model of the determinants of hours and earnings is developed (Section 2). On the basis of this model, a simplified net earnings function model is developed (Section 3), in which varying marginal wage rates and occupation-specific work-liesure preferences are represented. Bounded estimates of returns to occupational choice are then derived.

A number of specific issues are then discussed (Section 4). First, the present value of adjusted earnings differentials (denoted the net capital value) is demonstrated to provide a more appropriate measure of returns to a discrete occupational choice than the more commonly presented internal rate of return. Second, the appropriate treatment of schooling costs is discussed. Third, differential retirement probabilities are demonstrated to have little effect on estimated returns. Fourth, the ambiguities associated with observed, but not necessarily causally related, mortality differences are discussed. Fifth, the determination of the discount rate (nominal, real or income rate of interest) is examined, demonstrating that the appropriate rate, using cross-sectional earnings differentials, is the income rate, equal to the real rate less the anticipated rate of secular earnings growth.

The problem of risk is then examined (Section 5), with the derivation of risk-preference-conditional measures of the returns to occupational choice. The problem of the unobserved covariance of

earnings over time is treated, deriving a range of limiting values contingent on the assumption made concerning the stability over time of the individual's position in the earnings distribution.

Empirical Results

Lifecycle earnings functions for fifteen professional occupations are estimated (Section 6), using data for calendar year 1976 from the 1977 Current Population Survey Annual Demographic File. Although earnings of physicians are found to be consistently higher than earnings in alternative occupations, the marginal physician wage rate (increase in earnings resulting from a one hour increase in work) is found to be exceptionally low and to decline rapidly. For example, the marginal physician wage rate of $5.28 at age 50 is less than that of health technicians, $5.82, although median incomes are respectively $52,600 and $11,900.

Gross and net capital values of the choice of medicine over alternative careers (present values of adjusted lifetime earnings differentials) are then derived (Section 7). The net capital value of the choice of medicine as a career is found to be unambiguously positive by comparison to all alternative occupations at current schooling costs.

Even if medical school tuitions were increased to "full cost" levels but subsidies to other types of schooling were continued, medicine would continue to be a profitable career by comparison to all occupations other than law.

The general conclusions of the CPS earnings function analysis for physicians are confirmed in the estimation of earnings functions for ten medical specialties (Section 8), using the 1976 HCFA Survey of Physician Practice Costs and Incomes. In particular, low and rapidly declining marginal wage rates are estimated.

In contrast to the finding that the choice of medicine over alternative professional occupations is highly profitable, medical specialization is not found to be invariably profitable (Section 9). By comparison to general/family practice pediatrics is found to involve significant losses, while psychiatry and allergy/dermatology are at best break-even specialties. However, neurological and orthopedic surgery, obstetrics/gynecology and internal medicine are found to have substantial positive net capital values.

In a summary of the results (Section 10), the returns to medicine over alternative careers are demonstrated to be equivalent to an annual annuity (paid in each year from age 19 to age 64) of as much as $10,000 (in 1976 dollars, rising with nominal secular earnings growth). At highly subsidized schooling prices, internal (income) rates of return exceed 10 percent by comparison to all other occupations, and generally center around 14 percent, suggesting a real rate of return of perhaps 18 percent. Profitable medical specialties are found to exhibit annual annuity values of $5,000 to $10,000, with internal (income) rates of return generally in excess of 20 percent, although the annuity value of pediatrics is equivalent to an annual earnins sacrifice of almost $3,400.

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> After ten years of work on earnings functions, all we have is a dim light at the end of a tunnel: everyone has been wrong and everyone has been right because the problem has proved to be more complicated than was originally imagined.
>
> Mark Blaug
> (1976, p. 845)

1. WORK EFFORT AND RETURNS TO OCCUPATIONAL CHOICE

Even before the proliferation of studies of the returns to occupational choice under the rubric of contemporary human capital theory, as grounded in the work of Schultz (1960), Becker (1964), and Mincer (1958), professional practice was recognized as a distinct and possibly unique subject of microeconomic study. As early as 1945, Friedman and Kuznets portrayed the economics of independent professional practice as an intersection of the theory of the firm and of labor economics, with the professional practitioner simultaneously playing the roles of entrepreneur, of principle supplier of labor to the firm, and of human capital investor. However, because interest has focused primarily on the human capital investment aspects of professional training, the analytical complexity and richness associated with this juxtaposition of roles generally has not been recognized or exploited in the literature.

With the notable exception of Reinhardt (1975), who was concerned with the composition of inputs into professional (medical) practice, previous studies have been preoccupied with the estimation of returns to professional training and the choice of a professional career. Fundamental to such estimates is the concept of the "earnings function",

relating earned income to its determinants. From a very simple formulation, on the basis of which rates of return to schooling could be directly derived, theoretical development especially and empirical application to a lesser extent have involved the progressive generalization of the earnings function to incorporate such complex factors as, e.g., postschooling investment in and obsolesence and depreciation of human capital.

Variations in work effort have provided a relatively recent focus of interest in this context. Adjustments for these variations, however, have been grafted rather simplistically onto the existing earnings function analyses, without concern for such potential complicaions as, e.g., systematic variations in income-leisure preferences, the possible nonlinearity of the relationship of earnings to hours of work and the effects of age and experience on the returns to work effort in alternative occupations.

These lacunae in the analysis of returns to occupational choice as modified by variations in work effort provide the primary motivation for the present study. The conceptual importance of accounting for hours of work differentials in assessing returns to human capital investment was first stressed by Lindsay (1971), who demonstrated that, on the assumption that leisure is a normal good, the observed income differential associated with a human capital investment overstates the return to that investment. This is true because the investment serves to increase the wage rate (price of leisure), thus inducing a substitution of work (and hence consumption of purchased goods and

services) for leisure. Some fraction of the income differential then represents not a return to the human capital investment per se, but rather compensation for the additional work effort induced by the increased wage resulting from the investment.

The empirical significance of the adjustment of earnings differentials for variations in hours of work has been demonstrated by Eckaus (1973), examining returns to years of schooling, and Lindsay (1973), focusing on returns to physician training. Sloan (1976) has seriously questioned Lindsay's conclusion that medical training represents, at best, an only marginally profitable investment if appropriate adjustments for work differentials are made, arguing that this result derived from a substantial overestimate of physician hours relative to hours of work in comparison occupations. However, the basic thrust of Lindsay's argument has been generally accepted. Thus, for example, Sloan and Feldman (1977) have incorporated an hours-of-work adjustment in applying Rosen's (1977) human capital model to the estimation of the rate of return to medical training.

As Lindsay has observed, the adjustment of earnings for differences in work effort across occupations inevitably confronts what is essentially an index number problem. Assume that the wage rate (per hour) is higher in occupation i (e.g., medicine) than in comparison occupation j (e.g., college teaching) and the observed hours of work are also higher in i than in j.(1) If the returns to occupational choice i

are estimated on the basis of an upward adjustment of earnings in j by the ratio of hours in i to hours in j (a Paasche index), then real returns will be unambiguously overestimated, while a Lespeyre index (adjusting earnings in i downward by the ratio of hours in j to hours in i) will generally underestimate returns.

Even apart from this complexity, however, the adjustments proposed by Lindsay and employed, e.g., by Eckaus, Lindsay and Sloan and Feldman, effectively rest on several highly restrictive but implicit assumptions. Specifically, the proportionate adjustment of earnings requires the assumptions that

1. the number of hours worked is freely variable by the individual, i.e., institutional rigidities do not constrain the amount of time devoted to work;
2. relative hours worked in alternative occupations do not vary systematically over the working lifetime;
3. individual preferences for income versus leisure do not differ systematically across occupations; and
4. the wage rate is (a) given and (b) constant, i.e., earnings are a linear function of hours worked, with equality of the average and marginal wage rates.

If any one of these assumptions is violated, the conventional adjustments for interoccupational hours of work differentials are inappropriate.

With reference to medical practice and to a range of reasonable comparison occupations the first assumption, of freely variable hours of work, is probably not unreasonable, although constraints may be

encountered in particular employment settings. However, if the employment setting is itself subject to choice, if the option of a setting in which hours are variable is available, and if intraoccupational markets are in equilibrium, then no qualification is required in this dimension.

The second assumption, of lifecycle-constancy of relative hours in the alternative occupations, is implicit in the utilization of mean hours, uncontrolled for age or experience, in the available empirical estimates of the hours adjustment factors. Given the inversely exponential weight associated with differential earnings accruing further in the future, an observed mean differential in hours will have a greater effect on returns the greater the degree to which it is concentrated in the early phase of the working lifetime. This effect, however, will not be be reflected in the adjusted estimates available in the literature. Superfically, it might be thought that use of age- or experience-specific hours-of-work adjustments would have only second-order consequences for estimated returns. However, if the lifecycle profile of work effort (and as discussed below, of returns to work effort) varies significantly across occupations, the effects may indeed be substantial. Moreover, if age-experience distributions of personnel differ markedly across occupations, then significant differences in observed mean hours would be consistent with identical lifecycle profiles of work effort, raising the possibility that the conventional mean-hours adjustments incorporate serious biases.

The third assumption, of the absence of systematic variations across occupations in preferences in the income-work (leisure) space, is also subject to serious question. Specifically, an earnings differential which would just compensate one individual for the cost of a human capital investment which increases his wage rate will imply a surplus for an individual whose marginal disutility of work rises less rapidly with an increase in hours. Thus, interpersonal variations in the disutility of work will be reflected systematically in occupational choices. As a result, adjustments of earnings for hours differentials across occupations will result in biased estimates of real earnings differentials. If all labor-cum-human- capital markets were in perfectly-competitive, long-run equilibrium, then the marginal entrant into any occupation would be at least as well off in that occupation as in any other, and only inframarginal individuals would receive rents, although positive or negative net returns might be indicated by the conventional hours-adjusted earnings differentials. However, if restrictions on entry into alternative occupations exist, then these conventional adjustments might disguise the existence of substantial rents even at the margin if preferences differ significantly across occupations.(2)

The final assumption, of a constant marginal (equal to average) wage, is highly suspect, especially in the independent or

quasi-independent professions. This assumption rests on a conception of a market in which labor, in time-defined units, is exchanged for earnings at a fixed wage rate, implying that earnings are a strict linear function of the number of units sold. In fact, earnings in many occupations are a complex function of own time and other inputs subject to individual control. While this is explicitly the case in independent practice, e.g., in medicine or law, even in many ostensible "employee" situations, this characterization of earnings often applies, at least in the intermediate run.(3)

Several sources of a declining marginal wage rate can be suggested. First, individual efficiency may decline with an increase in hours of work, as reflected in a declining marginal product of labor. Second, observed total earnings may incorporate a significant fixed component, or rent, independent of hours of work and output. This would be the case, for example, in a group practice in which the earnings of a senior member include an essentially fixed element based upon the earnings of the group as a whole, or in an institutionally-based practice in which a salary or retainer is supplemented by fees for services provided. On either of these counts, the average wage rate would decline with increases in hours, lending a downward bias to hours-adjusted estimates of interoccupational earnings differentials.

A third source of average-marginal wage differences emerges when earnings are recognized as a function not only of own time but also of other inputs. If these other inputs are perfectly divisible and freely variable at fixed market prices, then variations in the marginal wage rate will be observed only if the production function, relating "output" (gross income) to inputs, exhibits increasing or decreasing returns to scale or is nonhomogeneous with respect to some or all inputs. If, in addition, markets for other inputs are imperfectly competitive, i.e., if the quantities of these inputs can be increased only at increasing prices, or alternatively, if these inputs are subject to indivisibilities, then net income might well rise more or less than proportionately with increases in hours.

Finally, if the market for the individual's output (services) is imperfectly competitive, then the marginal revenue product of hours of work will decline even if none of the factors discussed above serves to introduce a discrepancy between marginal and average wage rates. Consider, for example, an extreme case in which the production function exhibits constant returns to scale with respect to hours, but the elasticity of demand is (minus) unity; in this case the marginal wage rate would be zero at all levels of hours. In general, the marginal wage will decline more rapidly, the lower the elasticity of demand.

The possibility of inequality of average and marginal wage rates and of systematic interoccupational variations in utility functions and

in lifecycle patterns of work effort casts serious doubt on the validity of available estimates of returns to professional training and specialization. However, any attempt to incorporate these considerations into empirical analysis must confront a number of difficult theoretical and statistical issues.

2. A GENERALIZED LIFECYCLE MODEL OF THE DETERMINANTS OF HOURS AND EARNINGS AND THE RETURNS TO OCCUPATIONAL CHOICE

In principle, the lifecycle profiles of professional hours of work and earnings must be viewed as simultaneously determined to maximize expected lifetime utility subject to production, demand and supply function constraints. A point of departure is provided by the model developed by Reinhardt (1975, Appendix B), although it is necesary to extend and recast that model within a lifecycle framework.

Assume that a professional enters practice at time t_0 and has a maximum life expectancy of t_n. At time t $(t_0 \leq t < t_n)$ he confronts a demand function for his services of the form

$$(2.1) \quad P_t = P\,(Q_t;\, X_t,\, Z_{1t},\, Z_{2t}),$$

where P_t is the price received per unit of professional service rendered,

Q_t is the quantity of service provided,

X_t is a vector of variables describing consumers and characteristics of the market.

Z_{1t} is a vector of the professional practitioner's characteristics not subject to his control, e.g., age, and

Z_{2t} is a vector of demand-influencing professional characteristics which are subject to the practitioner's control (as discussed further below).

The demand function is assumed to have the usual properties; specifically, it is assumed that $\partial P_t / \partial Q_t \leq 0$. By convention, controllable professional characteristics will be defined so as to have positive effects on price, i.e., $\partial P_t / \partial Z_{2t} > 0$. Uncontrollable characteristics may have either positive or negative effects on price, and furthermore, the signs of these effects may change over time.

The production function for professional services can be expressed generally as

$$Q_t = Q\,(H_{pt},\ K_t;\ Z_{1t},\ Z_{3t}), \qquad (2.2)$$

where H_{pt} denotes time devoted by the practitioner to professional practice ,

K_t is a vector of inputs into professional practice other than the practitioner's own time, and

Z_{3t} is a vector of controllable practitioner characteristics which influence productivity.

Marginal productivities of the first and second factors are assumed to be positive.(4) As in the case of the effects of Z_{2t} on demand,

Z_{3t} can be defined such that its effects of productivity are also positive. Finally, also as in the case of the demand function, the effects of Z_{1t} (uncontrollable practitioner characteristics) may be (a) ambiguous and (b) variable over time.

Practitioner characteristics Z_{1t} and Z_{2t} enter the demand function because they affect the quality of services rendered, at least as perceived by consumers. In the production function Z_{1t} and Z_{3t} reflect the effects of uncontrollable and controllable practitioner characteristics on the productivity of inputs (own time and purchased) into professional practice. Of course, certain variables entering into the demand-influencing vector Z_{2t} may also appear in the productivity-influencing vector Z_{3t}.

While a number of characteristics might be hypothesized to enter into the controllable-characteristic vectors Z_{2t} and Z_{3t}, an obvious candidate for both is the time and effort devoted by the professional to the maintenance of his human capital (skills and capabilities). In the absence of continuing investment, his professional knowledge will become obsolete, with possible consequences for both his productivity and the perceived quality of his services. Only by engaging in a continuing monitoring of new developments can obsolescence be avoided.

For simplicity, assume that $Z_{2t} = Z_{3t} = Z_{*t}$ and that Z_{*t} is a function solely of time devoted to obsolescence-offsetting human capital formation, i.e,

$$(2.3) \qquad Z_{*t} = \int_{t_0}^{t} M(H_{m\tau})e^{-\delta(t - \tau)}d\tau,$$

where $H_{m\tau}$ is the time devoted to maintenance of skills and capabilities,

M is the production function for these skills and capabilities, and

δ is the rate of obsolescence or depreciation of skills and capabilities.

In this formulation skills and capabilities undergo exponential decay. Thus, time devoted further in the past has a lesser impact on current demand or productivity than time devoted more recently. On the other hand, time invested earlier generates a flow of returns over a longer period.

In addition to explicit acquisition of new knowledge, a practitioner's capabilities may improve through learning-by-doing. Thus, one might hypothesize that Z_{2t} and/or Z_{3t} would include the effect of cumulative time devoted to professional practice, e.g.,

$$(2.4) \qquad Z_{**t} = \int_{t_0}^{t} G(H_{p\tau})\ e^{-\delta'(t - \tau)}d\tau,$$

where δ' is the rate of obsolescence of competencies acquired incidental to actual professional practice, and

G is the learning function relating competency to time devoted to practice.

Finally, lifetime preferences or utility can be represented as

$$(2.5)\qquad U_t = \int_t^{t_n} S_{t\tau}\, V_\tau\, e^{-\rho(\tau - t)} d\tau ,$$

where U_t is the present value of expected future lifetime utility,

$S_{t\tau}$ is the probability of survival from t to τ ,

V_τ is expected "instantaneous" utility at time τ (defined below), and

ρ is the practitioner's subjective discount rate.

Instantaneous utility, V_t, is a function of the practitioner's consumption of goods and services and of time devoted to various types of work:

$$(2.6)\quad V_t = V(C_t, H_{pt}, H_{mt}),$$

where C_t is consumption of purchased goods and services.

Because the instantaneous utility function may change over time, e.g., with age or stage of the lifecycle, it may be more appropriate to replace V(...) by $V_t(...)$, or to include a vector of utility-function-shifting variables, Z_{4t}, as arguments of the instantaneous utility function, i.e.,

$$(2.6a)\qquad V_t = V(C_t, H_{pt}, H_{mt}; Z_{4t})$$

Given initial wealth, W_{t_0}, and anticipated prices of other practice inputs in all future periods, R_τ, the problem confronting the professional practitioner is to select those lifetime paths of hours devoted directly or indirectly to work ($H_{p\tau}$ and $H_{m\tau}$) and of

utilization of other practice inputs (K_τ) which maximize the present value of expected lifetime utility (U_t, equation 2.5), subject to the contraints that

$$(2.7)\quad H_{p\tau} + H_{m\tau} < \bar{H} \text{ for all } \tau \geq t, \text{ and}$$

$$(2.8)\quad \int_{t}^{t_n} (C_\tau + R_\tau K_\tau - Q_\tau P_\tau) e^{-r(t - \tau)} d\tau$$

$$\leq W_{t_0} e^{rt} + \int_{t_0}^{t} (Q_\tau P_\tau - R_\tau K_\tau - C_\tau) e^{r(t - \tau)} d\tau$$

where $\bar{H}$ is the total number of hours available at any time for work and leisure, and

r is the interest rate at which the practitioner can borrow and lend.

The first of these constraints simply requires that direct and indirect work activities not exceed the total number of hours available at any time. The second stipulates that the present value of all future excesses of gross outlays over practice receipts cannot exceed the present value of (a) initial wealth plus (b) prior excesses of practice receipts over gross outlays, where gross outlays include both consumption outlays and practice costs.

This model can be further generalized to incorporate a schooling period, over the course of which (a) practice receipts and costs are assumed to be zero, (b) time is devoted only to schooling and leisure (with the former entering the utility function uniquely), and (c) schooling is provided at specified prices. If maximum lifetime utility at the initiation of

the schooling period is U^P in professional practice P (or in a particular professional specialty) and U^A in the best alternative occupation (or specialty), then the present value of the net gain to entry into practice P is that increase in initial wealth which would just equate lifetime utility in the best alternative with lifetime utility in practice P.

The solution of an optional control problem of this scope and generality would be quite complex. However, the formal theoretic development of the model provides insight into the specification of simplified models amenable to solution and to estimation with available data.

3. SIMPLIFIED GROSS AND NET EARNINGS FUNCTION MODELS

In the absence of unambiguous measures of prices and outputs, the most obvious simplification of the foregoing model utilizes a gross earnings function. The gross earnings function can be viewed as the product of equations 2.1 and 2.2, i.e.,

$$(3.1) \quad Y_G = PQ = P(Q;\, X,\, Z_1,\, Z_2) \cdot Q(H_p,\, K;\, Z_1,\, Z_3)$$

$$= Y_G(H_p,\, K;\, X,\, Z_1,\, Z_2,\, Z_3)$$

where Y_G is gross practice earnings.

Derivation of the reduced-form gross earnings function requires the specification of functional forms for the demand and production functions. Because the productivity of time devoted to medical practice may be a complex function of the size of the practice or of inputs other

than own time, the standard Cobb-Douglas and CES production functions can be argued to be excessively restrictive (Reinhardt, 1975). One form of the production function which appears to be sufficiently general for present purposes is

$$(3.2)\quad Q = H_p^{\alpha_1} K^{\alpha_2} e^{\beta_0 + \beta_1 H_p + \beta_2 K + \beta_3 Z_1 + \beta_4 Z_2 + \beta_5 Z_3}$$

The marginal products of the two factors are, then,

$$\frac{\partial Q}{\partial H_p} = \left(\frac{\alpha_1}{H_p} + \beta_1\right) Q$$

$$\frac{\partial Q}{\partial K} = \left(\frac{\alpha_2}{K} + \beta_2\right) Q$$

Conjoining this production function with a constant elasticity of demand function, i.e.,

$$(3.3)\quad P = Q^{-b_1} e^{b_0 + b_2 X + b_3 Z_1 + b_4 Z_2}$$

the following reduced-form gross earnings function is obtained:

$$(3.4)\quad Y_G = PQ = H_p^{c_1} K^{c_2}$$

$$\exp(c_0 + c_3 H_p + c_4 K + c_5 Z_1 + c_6 Z_2 + c_7 Z_3 + c_8 X)$$

where the reduced-form coefficients c_i can be expressed in terms of the parameters of the underlying structural equations.

The natural logarithm of gross earnings ($\ln Y_G$) is, then, a linear function of the variables (and/or of natural logarithms of the variables) entering the production and demand functions. In the absence of data which would permit the simultaneous estimation of the demand and production functions, it will be impossible to identify the underlying structural parameters of these functions. Also because several of the "independent" variables in the reduced-form gross earnings equation are in fact endogenous in the larger model, the estimated parameters will be subject to simultaneous equations bias. However, this is also unaviodable given the unavailability of data which would permit indentification of other equations in the model, most notably the utility function.

With estimates of the parameters of the gross earnings function, the assumption of utility maximization and of a particular functional form for the utility function permit the derivation of (non-unique) utility function parameters consistent with (but not uniquely implied by) observed behavior. For present purposes, the utility function is assumed to exhibit constancy of the marginal utility of income, implying that utilities (disutilities) are additive. Thus, utility can be expressed as

$$(3.5)\ V = Y_N - V^*(H_p)$$

where $Y_N = Y_G - RK$ is net income.

Maximization of V with respect to H_p and K, subject to the gross earnings function and an hours constraint ($H_p \leq \overline{H}$) and assuming an

interior solution $(H_p < \bar{H})$, gives the following first-order conditions:

$$(3.6a) \quad \frac{\partial V}{\partial H_p} = \frac{\partial Y_N}{\partial H_p} - \frac{\partial V^*}{\partial H_p} = (\frac{c_1}{H_p} + c_3)Y_G - \frac{\partial V^*}{\partial H_p} = 0$$

$$(3.6b) \quad \frac{\partial V}{\partial K} = (\frac{c_2}{K} + c_4)Y_G - R = 0$$

Given observed (e.g., mean) values of H_p, K and Y_G, equations 3.6a and 3.6b can then be solved for, or at least will place constraints on, the parameters of the utility function.

The marginal wage rate in this model is

$$(3.7) \quad w_m = \frac{\partial Y_N}{\partial H_p} = (\frac{c_1}{H_p} + C_3)Y_G,$$

which will vary with variations in hours worked. As can be easily demonstrated, the marginal wage rate will be constant, equal to the average wage rate, if and only if the gross earnings function is Cobb-Douglas $(c_3 = c_4 = 0)$ with constant returns to scale $(c_1 + c_2 = 1)$, which would be implied only by a perfectly competitive market (price independent of quantity supplied) conjoined with a constant return to scale production function. For the reasons discussed in the first section of this paper, these conditions are unlikely to be met in the case of independent professional practice. An elasticity of demand less than unity would imply less than constant returns to scale in the gross earnings function even if the production function itself were homogeneous of degree one. Fatigue and related effects will further imply a nonhomogeneous production function $(c_3 < 0)$. Thus, a declining marginal wage rate would be anticipated.

Although abstracting from the complications introduced by competency enhancing activities and by learning-by-doing,(5) this simplified gross earnings function model is still quite complex. However, as developed above, this model fails to consider a potentially significant source of variation in the hours-earnings relationship, specifically, the effects of age or experience on the marginal physicial or revenue product of time devoted to practice.

Incorporation of experience effects would greatly complicate the gross earnings function model. These elaborations can be incorporated, however, if an otherwise simpler net earnings function is employed, abstracting from inputs other than the practitioner's own time (i.e., from inputs K). In this case a reasonably rich set of hours-experience interactions can be represented.(6)

Consider a net earnings function for individual a in occupation (or specialty) i of the form

$$(3.8)\ Y_{Nia} = H_{ia}^{(\alpha_{0i} + \alpha_{1i}E_{ia} + \alpha_{2i}E_{ia}^{2})} e^{\beta_{0i} + \beta_{1i}A_{0ia} + \beta_{2i}X_{ia}}$$

where E_{ia} is years of labor-force experience (active practice),

A_{0ia} is age at labor-force entry (entry into active practice), and

X_{ia} is a vector of other variables influencing net earnings.

In this formulation(7) experience serves not to shift the earnings function in a logarithmically parallel manner (as in the conventional earnings function in which E and E^2 are subsumed in the vector X), although this effect of experience can also be permitted here, but rather to alter the elasticity of earnings with respect to hours

$$(3.9) \quad \eta_{Y,H} = \alpha_{0i} + \alpha_{1i}E_i + \alpha_{2i}E_i^2,$$

and hence the marginal wage rate,

$$(3.10) \quad w_{mi} = \frac{\partial Y_{Ni}}{\partial H_i} = \frac{\alpha_{0i} + \alpha_{1i}E_i + \alpha_{2i}E_i^2}{H_i} Y_{Ni}.$$

Given observed hours of work, on the assumption of utility maximization the slope of the earnings function (the marginal wage rate) is equal to the marginal rate of substitution (the slope of the indifference curve) between hours and earnings at that point. Retaining the assumption of an additive utility function, the marginal rate of

substitution is independent of the level of earnings, i.e., the indifference curves are vertically parallel. Although the convexity of the indifference curves (the rate at which the marginal rate of substitution increases) is not known, assuming the degree of convexity permits specification of the entire preference surface.

On the basis of the convexity-conditional preference function for individual a in occupation/speciality i and the estimated earnings functions for alternative occupations/specialities j , optimal hours and earnings in each alternative occupation/specialty can be determined. Also conditional on the assumed degree of convexity of the indifference curves, the income equivalents of the differentials in optimal hours of work across alternative occupations/specialities can be determined. Thus, an hours-adjusted earnings differential between i and j for individual a can be derived, equal to observed earnings in i less (a) optimal earnings in j and (b) the income equivalent of the excess of hours in i over optimal hours in j .

If a is now redefined as age for a given individual, then discounting the hours-adjusted earnings differentials between occupations/specialties i and j to the point of entry into practice provides an estimate of the present value of the earnings gain to the incumbent in i of the choice of i over j. Of course, because this estimate of differential lifetime earnings is conditional on the assumed degree of convexity of the i-incumbent's indifference curves in the

hours-earnings space, it may in fact be sensitive to the convexity assumption. More importantly, even if the degree of convexity could be uniquely determined, the estimate of returns to i over j based on the utility function of the i incumbent will differ from the estimate based on the utility function of the j incumbent if their revealed utility functions differ significantly.

The convexity-conditional estimate of the present value over the lifetime of differential hours-adjusted earnings, as a measure of the returns to occupational choice, can then be compared to the more conventional measures available in the literature. Specifically, the following comparison measures can be computed:

(1) the present value of earnings differences unadjusted for differences in hours (employing observed earnings in alternative occupations);

(2) the present value of earnings differences after adjusting earnings in the alternative occupation/specialty to correspond to observed hours in the "own" occupation/ specialty (a Paasche index), recognizing the non-linearity of the hours-earnings relationship in the alternative occupation;

(3) the present value of earnings differences after adjusting earnings in the "own" occupation/specialty to correspond to observed hours in the alternative occupation/specialty (a

Lespeyre index), recognizing the nonlinearity of the hours-earnings relationship in the "own" occupation;

(4) and (5) Paasche and Lespeyre estimates corresponding to (2) and (3), but imposing the conventional assumption that the earnings functions are linear in hours (proportionately adjusting observed earnings for differences in hours).

Operationally, mean observed values of all relevant variables in all alternative occupations/specialties will be employed below in the estimation of returns to occupational choice. Denote mean age of entry into occupation/specialty i as $\bar{A}_{\emptyset i}$ and mean hours in i at age a as $\bar{H}_{ia}$. Given the mean age at entry, $\bar{A}_{\emptyset i}$, mean experience at age a is

$$(3.11) \qquad \bar{E}_{ia} = a - \bar{A}_{\emptyset i}$$

Given this information and the mean value of X_{ia}, earnings at age a of a person with mean characteristics in occupation/specialty i, denoted $\bar{Y}_{Nia}$, can be computed from equation 3.8. Assuming a utility function of the form

$$(3.12) \qquad V = Y_N - \gamma_\emptyset H^{\gamma_1}, \ \gamma_1 > 1$$

utility maximization implies that

$$\frac{\partial V}{\text{[illegible]}} = \frac{\partial Y_N}{\partial H} - \gamma_1 \gamma_0 H^{\gamma_1 - 1} = \frac{\alpha \text{ [illegible] } {}_2 E^2}{\text{[illegible]}} Y_N - \gamma_1 \gamma_0 H^{\gamma_1 - 1} = 0.$$

This equation, for a particular specialty and age, can be solved for γ_{0ia}, given an assumed value of γ_{1ia}, i.e.,

$$(3.13)\quad \gamma_{0ia} = (\alpha_{0i} + \alpha_{1i}\bar{E}_{ia} + \alpha_{2i}\bar{E}^2_{ia})\ \bar{H}_{ia}^{-\gamma_{1ia}}\ Y_{Nia}/\gamma_{1ia}.$$

Increases in the assumed value of γ_{1ia} will then imply increased convexity of indifference curves in the hours-earnings space.

The implications of varying γ_0 and γ_1 subject to equation 3.13 are indicated graphically in Figure 3.1. Net earnings, Y_N, are represented in the upper quadrant as a function of hours of work. The implied marginal wage function, $w_m = \partial Y_N/\partial H$, is portrayed in the lower panel. Because the marginal utility of income is stipulated to be constant and equal (arbitrarily) to unity, the total disutility of labor, $V^* = \gamma_0 H^{\gamma_1}$, and the marginal disutility of labor, $\partial V^*/\partial H = \gamma_1\gamma_0 H^{\gamma_1 - 1}$, can be interpreted in income-equivalent (monetary) units. The total and marginal disutility of labor functions are thus presented in the upper and lower quadrants, respectively. Two alternative sets of disutility functions are indicated, corresponding to the parameter values (γ^1_0, γ^1_1) and (γ^2_0, γ^2_1), where $\gamma^1_1 < \gamma^2_1$ and $\gamma^1_0 > \gamma^2_0$.

The utility maximizing number of hours of work, $\bar{H}$, is determined by the intersection of the marginal wage function and the marginal disutility of labor function in the lower quadrant, or equivalently, at the point in the upper quadrant at which the slopes of the net earnings and total disutility of labor functions are equal.

Indifference curves implied by these disutility of labor functions are also portrayed in the upper quadrant. The slope of the indifference curve (the marginal rate of substitution between earnings and work) is simply equal to the ratio of the marginal disutility of work to the (constant, unitary) marginal utility of income, equal under present assumptions to the marginal disutility of work. Thus, increases in γ_1 (compensated by reductions in γ_0) give rise to progressively more convex indifference curves, each of which is tangent to the net earnings function at $\bar{H}$ hours of work.

An important issue which arises in this context concerns the nature of changes in the utility function with age. At each age, a spectrum of mutually consistent pairs of values of γ_0 and γ_1 can be determined. However, for purposes of estimating present values of lifetime earnings in alternative occupations/specialties, it is necessary to discount actual or hypothetical earnings over all ages. Thus, pairs of utility function parameters γ_{0ia}, γ_{1ia} must be specified for each age. Clearly, since a single pair of parameter values is not uniquely determined for any age, age profiles of parameter values are similarly indeterminate.

Two alternative approaches to determination of consistent age profiles of utility function parameters are proposed here, based on very different conceptions of the effect of aging on the marginal disutility of work. Under the first alternative age is viewed as increasing the disutility of work equiproportionately, regardless of the number of hours, i.e., the disutility of work function shifts upward in a

logarithmically parallel manner. With respect to the utility function specified in equation 3.12, this is equivalent to permitting γ_0 to vary with age, holding γ_1 (in equation 3.13) constant. Here, presumably, γ_0 would be found to rise with age, at least beyond some point, and all levels of work would thenceforth become equiproportionately more onerous.

An alternative characterization of the relationship of the disutility of work to age assumes that age has only a "fatigue effect," i.e., that the disutility function rotates upward, with the relative age-induced increase in disutility rising more than proportionately with increases in hours. One characterization of this relationship would "anchor" the disutility function (e.g., at one hour of work), with increases in age serving to rotate the function upward around this point. Imposing this characterization on the utility function embodied in equation 3.12, γ_0 (the total disutility of one hour of work, since $\gamma_0 H^{\gamma_1} = \gamma_0$ if $H = 1$) would be held constant over all ages, and numerical techniques would then be employed to determine an age profile of values of γ_1 consistent with this stationary value of γ_0 and with the γ_0, γ_1 relationship given in equation 3.13. Presumably, beyond some point γ_1 would then be found to rise with age.

If the earnings function were invariant with respect to age, either of these characterizations of the effects of aging on the disutility of work would be sufficient to induce a reduction in hours of work with advancing age. However, the earnings function clearly will vary with

age, if only because experience and age will be perfectly correlated (assuming no periods of labor force nonparticipation other than schooling and identical age-schooling relationships across individuals).(8) Furthermore, experience may have complex consequences for the earnings function, altering either the marginal productivity of time and/or the entire function, and in either case the effect need not be monotonic. Thus, observed hours may either rise or fall with age. Nonetheless, the plausibility of the model will depend upon the finding of monotonic increases with age of either (a) γ_0, holding γ_1 constant (the first, equiproportionate, characterization of the effect of aging on the disutility of work), or (b) γ_1, holding γ_0 constant (the second, fatigue, characterization of the aging effect).

Having determined a spectrum of lifecycle paths of alternative consistent pairs of values γ_{0ia}, γ_{1ia}, the hours and earnings which an "average" person of age a in occupation/specialty i would choose were he instead in occupation/specialty j can be determined by maximizing utility subject to the constraints of the earnings function estimated for occupation/specialty j . Denoting the resultant solutions by $\bar{Y}_{Njia}$ and $\bar{H}_{jia}$, the income effect of the change in hours from $\bar{H}_{ia}$ to $\bar{H}_{jia}$, can be determined. Let $\bar{V}_{ia}$ be defined as

$$(3.14)\quad \bar{V}_{ia} = \bar{Y}_{Nia} - \gamma_{0ia}\bar{H}^{\gamma_{1ia}}$$

Then

$$(3.15)\quad \bar{Y}^{C}_{Nia}(\bar{H}_{jia}) = \bar{V}_{ia} + \gamma_{0ia}\bar{H}^{\gamma_{1ia}},$$

where the superscript C denotes a compensated level of income, is the level of income at which an age a incumbent in i would just be compensated for a change in hours from the actual $\bar{H}_{ia}$ to the hypothetical $\bar{H}_{jia}$ which he would choose to work if he faced the j earnings function. The difference

$$(3.16)\quad \bar{Y}^{C}_{Nia}(\bar{H}_{jia}) - \bar{Y}_{Njia}$$

represents the hours-compensated income differential between i and j for occupation/specialty i incumbents at age a .

It should be noted that the alternative of detemining the compensated level of income in occupation/specialty j consistent with observed hours in i , i.e.,

$$(3.17)\quad \bar{Y}^{C}_{Njia}(\bar{H}_{ia}) = \bar{V}_{jia} + \gamma_{0ia}\bar{H}_{ia}^{\gamma_{1ia}}$$

where

$$(3.18)\quad \bar{V}_{jia} = \bar{Y}_{Njia} - \gamma_{0ia}\bar{H}_{jia}^{\gamma_{1ia}},$$

compared to actual earnings in i would lead to an identical estimate of the hours-compensated income differential between occupations/specialties i and j as viewed from the vantage point of incumbents in i , i.e.,

$$(3.19) \quad \bar{Y}^{C}_{Nia(\bar{H}_{jia})} - \bar{Y}_{Njia}$$

$$= \bar{Y}_{Nia} - \bar{Y}^{C}_{Njia(\bar{H}_{ia})}$$

This is implied by the assumed constancy of the marginal utility of income, which implies vertically parallel indifference curves in the hours-earnings space.

4. CAPITAL VALUES OF AND RETURNS TO OCCUPATIONAL CHOICE

Internal rates of return represent the most commonly presented measures of the gains or losses associated with occupational choice. However, because occupational choices are exclusive, discreet and noncontinuous, these measures can be argued to be of little relevance. The internal rate of return, in other words, is appropriate only in the context of continuously variable investment, in which case the rational individual will invest up to the point at which the marginal internal rate of return is equal to the interest rate available on alternative investments involving comparable risk.

A more appropriate measure of returns in the present context is provided by the capital value of the choice of occupation i over occupation j , i.e., by the present value of all earnings differentials between occupations i and j . This represents, in effect, the initial wealth an individual would be willing to sacrifice in order to obtain title to the occupation i rather than occupation j earnings; if negative, this capital value is the increment in initial wealth which would compensate the individual for the foreclosure of occupation j and forced entry into i .

In general, capital values of and internal rates of return to occupational choice will lead to qualitatively similar conclusions concerning the relative desirability of alternative occupations. However, in may circumstances internal rates of return will provide a highly distorted picture. Thus, earnings in one occupation may be slightly above earnings in another at all points in the working lifetime, while the costs of occupational entry (time and out-of-pocket costs) may be identical. Under these circumstances, the net internal rate of return to the choice of the first occupation will be infinite, although the capital value (while positive) may be small.

This type of distortion will be particularly serious in any comparison of three or more occupations. For example, if the costs of entering the first of the above occupations rather than a third alternative are high, the internal rate of return to that choice may be relatively low, although the net capital value may be high. Thus, if the two alternatives were ranked according to their desirability relative to the first, the internal rates of return would indicate that the first was vastly superior to the second but only somewhat superior to the third. In fact, as indicated by the capital values, the first is only marginally preferrable to the second but substantially better than the third. In short, a relatively lower rate of return on a large investment is preferrable to an extremely high (even infinite) return on a small (or zero) investment. This is precisely why the internal rate of return is misleading as an indicator of returns to occupational choice, where investments are discrete and discontinuous.

Competitive equilibrium in the labor and professional services markets can be easily defined in terms the capital values of occupational choices. Discounting appropriately defined net earnings differentials (as discussed below) at a rate equal to the interest rate which could be earned on alternative investments of comparable risk (as also discussed below), a competitive equilibrium relationship between earnings in any two occupations will exist when the net capital value of the choice of either over the other is zero. Hence, the magnitude of the net capital value (positive or negative) is an indicator of the degree of departure from competitive equilibrium, indicating the existence of either (a) temporary disequilibrium or (b) departures from the perfectly competive norm. In the empirical analysis which follows, evidence of the former is in fact indicated with reference to at least one professional occupation (computer and mathematical specialists), in which case disequilibrium is explained by the rapid recent growth of demand in conjunction with relatively inelastic short-run supply. In at least two other cases (medicine and law), the evidence suggests substantial constraints on competition, taking the form of rationed schooling, licensure restrictions, etc. The important point here is that the estimates of net capital values represent the point of departure for further analysis, not the conclusion of the analysis. Only if the net capital values (plus or minus a reasonable margin of error) are found to be zero is there nothing else to explain. The finding of substantial net capital values requires that an explanation for the departure from competitive equilibrium be sought.

In order to compute the capital value of the choice of one occupation over another, it is necessary to specify (1) the precise monetary streams to be discounted, (2) the period over which these streams are to be evaluated, (3) the appropriate treatment of mortality differentials, and (4) the discount rate.

In this study, in which the focus is on returns to professional training, the relevant streams are either earnings or earnings net of out-of-pocket schooling costs (positive or negative). In the first case, the result is an estimate of the gross capital value of the occupational choice; in the second the net capital value is estimated. Note that out-of-pocket schooling costs do not include foregone earnings (already incorporated in the gross capital value estimates, as discussed below) but do include (with positive signs) tuition, fees, books, supplies, etc., and (with negative signs) scholarships and fellowships, grant-equivalents of educational loan subsidies, etc. If the net social (rather than private) capital value were to be determined, all subsidies to schooling would be included in the measure of out-of-pocket schooling costs. With several important exceptions, relating to the effect on net private capital values of a shift of "full cost" tuition and the elimination of schooling related subsidies, the present analysis is restricted to private out-of-pocket schooling expenses as conventionally defined.

In principle, net private capital values should be determined by discounting posttax earnings differentials, while net social capital values would discount pretax earnings differentials. On the basis of

substantial evidence (Pechman and Okner, 1974) that, at upper income levels, average effective income tax rates are remarkably invariant with respect to income, the present analysis utilizes pretax earnings. Because of the invariance of the average effective tax rate, this will affect only the magnitude, not the sign, of the estimated net capital values, and market equilibrium will still be indicated by a zero net capital value associated with the choice of any one occupation over any other. The appropriate margin of error around zero will, of course, be magnified (by the reciprocal of one minus the tax rate).

The period over which earnings net of out-of-pocket schooling costs are discounted is defined to include the schooling period. Because the focus here is restricted to professional occupations, broadly defined, a minimum of high school graduation is assumed in all occupations. Therefore, in the interoccupational analysis earnings net of schooling costs, commencing at age 19, are discounted to age 18, the assumed age of high school graduation.

Discounting earnings in the alternative occupations to a common age explicitly takes into account foregone earnings costs associated with the choice of one occupation over the other: If it is assumed that prior to the completion of the schooling or training period, earnings are in fact zero, i.e., if $Y_{Nia}=0$ for all $a \leq L + F_i$, where F_i is the years of schooling required after age L (the lower-bound of the working lifetime, e.g., age 18) for entry into profession i , then differential foregone earnings associated with the choice of profession i over profession j will have been incorporated in the

estimates. Also, since foregone earnings differentials have been taken into account, in the absence of subsidies no adjustment of the resulting estimates is required for room, board and other living costs over the schooling or training period. Thus, as discussed above the net capital value of the choice of i over j can be obtained simply by deducting from the gross capital value only the present value of the differential costs of schooling per se (out-of-pocket costs of tuition, fees, books, etc., net of grant aid). To the degree to which room and board costs are subsidized, of course, the present value of these subsidies should be treated as a negative cost of schooling.

In principle, the issues raised by differential patterns of retirement across occupations should be addressed. If retirement represented a purely voluntary action, with reference to which external forces were neutral, then the issue of retirement would become a special case of the larger issue of the determination of work effort (hours of work) discussed previously. Clearly, however, retirement is not invariably voluntary, and external constraints are greater and more prevalent in some occupations than in others.

Fortunately, as a practical matter these issues can be sidestepped since their resolution will have little impact on the resulting estimates. Discounting earnings differentials to age 18, the weight given to earnings at more advanced ages is extremely small, especially when mortality probabilities are taken into account. For example, with a discount rate of five percent, a one dollar difference in earnings at age 70 would have an age 18 present value of only eight cents, and if

the survival probability is, e.g., 0.75, this would be reduced to six cents. Thus, the net capital value estimates are dominated by earnings differentials at younger ages, rendering the estimates quite insensitive to variations in the terminal year or the precise treatment of retirement probability differentials. For present purposes, a retirement age of 65 is assumed in the interoccupational analysis, while a retirement age of 70 is stipulated in the assessment of the returns to physician specialization.

Since variations in hours of work, over occupations and, within occupations, over the lifecycle, are taken into account, with hours assymtotically approaching zero with increases in age in most occupations, and in light of the freedom available in most professions to continue active practice to extremely advanced ages, the most legitimate treatment would be to ignore retirement altogether and to take into account, in addition to the occupation-specific age-hours relationship, only the effects of mortality. Given the low weights attached to earnings at advanced ages this is the procedure which de facto has been employed.

Mortality differences themselves, however, raise serious issues. While mortality rates are generally significantly lower in professional occupations than for the population at large, great differences are observed across professions. For example, age-specific death rates of physicians are almost 80 percent greater than those of college faculty, at least between the ages of 25 and 64. The critical issue is whether these occupation-specific mortality adjustments should be incorporated

in the estimation of returns to occupational choice. If the entire difference in mortality experience were attributable to occupation per se, then this would be an appropriate procedure. However, to a greater or lesser extent these differences in mortality experience undoubtedly reflect the selection or self-selection into occupations of persons with occupation-independent mortality probabilities which differ systematically from those of the population at large and from those of entrants into alternative occupations.

If in fact ex ante mortality probabilities differ significantly across entrants into alternative occupations, then it is probably also the case that mortality expectations of marginal entrants into an occupation will tend toward those of the population at large. Because occupations differ in the lifecycle profile of earnings, it is clearly necessary to adjust expected future earnings for survival probabilities, but the derivation of appropriate survival probabilities is ambiguous.

For the representative incumbent in an occupation, the issue is one of ex post occupational versus ex ante selection differences in mortality/survival prospects. At one extreme, if observed interoccupational differences in mortality are causally related to occupation, then lifecycle earnings in each occupation should be adjusted for that occupation's mortality experience. If the effects derive entirely from selection into alternative occupations of persons with systematically different mortality prospects, then the returns to the choice of occupation j over i for a j incumbent should be estimated on the basis of earnings in both i and j adjusted for j

mortality. For the marginal entrant, if the observed mean differentials are due to selection, while the marginal entrant's prospects converge toward those for the population, an occupation-independent adjustment would be appropriate.

To indicate the effects of mortality adjustments on estimated returns to occupational choice, four alternative sets of estimates will be developed in the analyses which follow. As a basis for comparison, the first incorporates no adjustment for mortality On the assumption that the marginal entrant into any occupation has ex ante mortality prospects corresponding to those of the population at large, the second adjusts earnings in all alternative occupations for age-specific mortality of the white male population. The third, interpreting observed interoccupational differences in mortality as due entirely to selection, utilizes the mortality experience of the incumbents in any occupation as the basis for adjusting earnings in any alternative occupation. Finally, the fourth assumes that observed interoccupational differences in mortality are due entirely to the causal effects of occupation, and earnings in each occupation are adjusted for the mortality experience of its incumbents.

Finally, the issue of the discount rate must be considered. The capital value of the choice of occupation i over occupation j for a person graduating from high school at age L is simply

$$(4.1)\quad C^{n}_{ij} = \sum_{a=L+1}^{U} (S_{iLa}\hat{Y}''_{Nia} - S_{jLa}\hat{Y}''_{Nja})\,(1+i)^{-(a-L)}$$

where L + 1 is the lower bound on the working lifetime,

U is the upper bound on the working lifetime,

S_{iLa} is the probability that an occupation i incumbent will survive from age L to age a,

$\hat{Y}''_{Nia}$ is the predicted nominal net earnings of an occupation i incumbent at age a, appropriately adjusted for hours of work differentials between occupations i and j (as discussed further below) and in the case of net values also incorporating (negatively the net out-of-pocket costs of schooling required for entry into occupation i,

i is the nominal discount rate, and

C^{n}_{ij} is the estimated nominal capital value of the choice of i over j.

If inflation at an annual rate d is anticipated to be observed over this individual's lifetime, then the real capital value of the choice of i over j is

$$(4.2) \quad C^{r}_{ij} = \sum_{a=L+1}^{U} (S_{iLa}\hat{Y}'_{Nia} - S_{jLa}\hat{Y}'_{Nja})\,(1+r)^{-(a-L)}$$

where $\hat{Y}'_{Nia} = \hat{Y}''_{Nia}\,(1+d)_{-(a-L)}$,

r is the real discount rate, and

C^{r}_{ij} is the estimated real capital value of the choice of

However, if the real and nominal interest rates are appropriately defined, i.e., if

$$(4.3)\quad (1 + i) = (1 + r)\ (1 + d) = 1 + r + d + rd \simeq 1 + r + d,$$

$$\text{and } i = r + d + rd \simeq r + d,$$

then the nominal and real capital values will be equal. In short, the capital value of the choice of occupation i over occupation j will be invariant with respect to the rate of inflation because the nominal discount rate varies by definition with the rate of inflation.

Thus, if the individual is age L in some year t_0, then it is necessary only to predict earnings in constant (year t_0) dollars as long as an appropriate estimate of the real interest rate is employed in estimating the capital value of the choice of occupation i over j.

In fact, earnings in each occupation at each age for an individual of age L in year t_0 will be predicted on the basis of observed earnings of incumbents of each age a in year t_0, i.e., on the basis of cross-sectional observations of earnings as a function of age. These observations, however, are not predictions of real earnings which will be observed in the future because they do take into account secular real earnings growth, i.e., increases over time in the real earnings of persons of all ages. Thus, if the predicted earnings of a person of age a in year t_0 are $\hat{Y}_{Nia(t_0)}$, then the predicted earnings of a person of age a in year t_1, will be

$$(4.4)\quad \hat{Y}'_{Nia(t_1)} = \hat{Y}_{Nia(t_0)}\ (1 + g)^{t_1 - t_0}$$

For a person of age L in year t_0, $t_1 - t_0 = a - L$. Thus,

$$
\begin{aligned}
C_{ij} &= \sum_{a=L+1}^{U} (S_{iLa}\hat{Y}'_{Nia} - S_{jLa}\hat{Y}'_{Nja})\,(1 + r)^{-(a - L)} \\
&= \sum_{a=L+1}^{U} [S_{iLa}\hat{Y}_{Nia}(1 + g)^{a - L} - S_{jLa}\hat{Y}_{Nja}(1 + g)^{a - L}]\,(1 + r)^{-(a - L)} \\
&= \sum_{a=L+1}^{U} (S_{iLa}\hat{Y}_{Nia} - S_{jLa}\hat{Y}_{Nja})\,(1 + g)^{a - L}\,(1 + r)^{-(a - L)} \\
&\simeq \sum_{a=L+1}^{U} (S_{iLa}\hat{Y}_{Nia} - S_{jLa}\hat{Y}_{Nja})\,(1 + r - g)^{-(a - L)}
\end{aligned}
\tag{4.5}
$$

Thus, defining what Tobin (1971) has characterized as the income rate of interest, ρ , as the real interest rate, r , minus the anticipated rate of secular real income growth, g , then the estimated capital value of the choice of occupation i over j, utilizing cross-sectional observations of earnings as a function of age and discounting at the income rate of interest, will equal the capital value that would be derived utilizing actual predictions, real or nominal, of future earnings, and discounting at the appropriate real or nominal discount rate.

In summary, since the capital values of occuational choice derived here will be based on cross-sectional relationships between earnings and age, the conceptually appropriate discount rate is the income rate of interest, i.e., the real interest rate minus the rate of secular real income growth (the rate at which the cross-sectional age-earnings relationships are shifting upward over time).

While primary emphasis will be placed on the estimated capital value of the choice of occupation i over j , estimates of internal

rates of return will also be presented. In assessing these estimates, however, it is necessary to compare them to an independent estimate of the income rate of interest. Thus, the income internal rate of return estimated on the basis of cross-sectional observations of earnings as a function of age will be that value of ρ (= r - g) for which the capital value C_{ij} in equation 4.5 is zero. The corresponding real internal rate of return will equal the estimated income rate of return plus the anticipated rate of secular real earnings growth. Thus, although the internal rate of return can be computed without considering the rate of secular earnings growth, interpretation of the resultant estimate requires that the rate of secular earnings growth be incorporated.

The question of the appropriate magnitude of the discount rate can be decomposed into two components. First, what is the magnitude of the real interest rate confronting the individual? Second, what is the appropriate adjustment for anticipated secular earnings growth? With reference to the first of these questions, the general answer is either (a) the rate at which the individual can borrow in order to undertake the human capital investment necessitated by the choice of a professional career or (b) the rate he can expect to earn on some alternative investment of comparable risk. Because variations in risk across occupations will be considered below, for present purposes alternative occupations will be considered equally risky and attention will be focused on comparably risky nonoccupational investment alternatives.

In the absence of legal-institutional constraints on the capital market, the rate at which an individual could borrow to finance an investment would equal the anticipated rate of return on that investment (ignoring transactions costs). In fact, the functioning of the capital market is constrained, especially in the financing of "unsecured" investments, e.g., human capital, by such legal provisions as the prohibition of involuntary servitude (and associated bankruptcy laws). Thus, the rate of interest at which an individual can borrow may well depend critically on the source of funds and may vary significantly over individuals and over amounts borrowed. For example, the (implicit or explicit) rate at which an individual can borrow within the family may be substantially less than the rate at which funds can be acquired from external sources, and some individuals will enjoy greater access to intrafamily funds than others.

Because there is no necessary barrier in principle to improved capital market functioning, as discussed at length in Dresch (1978), the present analysis relies primarily on estimates of returns on comparably risky non-human-capital investment alternatives. For comparative purposes, the alternative of the real rate of interest on unsecured personal loans is also considered.

The appropriate adjustment for anticipated secular real earnings growth is more speculative. The adjustment suggested by Tobin (1971), the rate of productivity growth in the economy at large, is clearly excessive, since it is due in part to a shift in the composition of the labor force toward occupations with higher earnings. A more appropriate

measure would be provided by direct estimates of the rate of secular upward shift in age-earnings profiles, an approach which will be employed in a subsequent stage of this study. For present purposes, reasonable bounds on the rate of real secular earnings growth will be employed.

5. THE PROBLEM OF RISK IN OCCUPATIONAL CHOICE

It has been frequently observed (e.g., Becker 1964) that the risks associated with human capital investments are generally higher than the risks of alternative classes of investment and that these risks tend to rise with the level of the investment, e.g., that the risks of graduate or professional training are greater than those of high school training. However, no serious attempt has been made to take these differential risks into account in the estimation of the returns to human capital investments.(9) The reason for this relative lack of serious attention is probably best explained by the complexity of the problem, both conceptually and empirically.

Conceptually, there are two basic issues, one subjective and one objective. The subjective issue concerns individual attitudes toward risk, while the objective issue concerns the variance in the expected value of lifetime earnings. Consider first the objective issue.

Assume that earnings y in any year (or at any age) are drawn from a distribution (not necessarily normal) with mean μ and variance σ^2. The draw in each year is independent of the draw in any previous or subsequent year. For the moment, assume also that the individual's subjective discount rate is zero, i.e., that the present value of lifetime earnings is simply equal to the undiscounted sum of earnings in each year.

In this situation the mean of earnings over the lifetime, $\overline{y}$, according to the Central Limit Theorem, is distributed with mean μ and variance σ^2/n, where n is the length of the working lifetime. Clearly, as n increases σ^2/n assympotically approaches zero. Expected lifetime income, however, is $n\overline{y}$, which can be demonstrated to be distributed with mean $n\mu$ and variance $n\sigma^2$ (i.e., if x is distributed with mean μ and variance σ^2, then, for any constant a, ax is distributed with mean a μ and variance $a^2\sigma^2$). In short, even if earnings in each year are independently determined subject to the same distribution, the variance of lifetime earnings will be a linear function of the working lifetime, as will the expected value of lifetime earnings. This is the sense in which risk is attached to occupational choice.

The preceeding is, in fact, a rather special case, simply because earnings in any year have been assumed to be determined independently of earnings in any other year. An alternative, limiting case serves to indicate the possibly even greater magnitude of the risk confronting an

individual making an occupational decision. Consider a situation in which earnings in the first year of the working lifetime, y_1, are drawn, as before, from a distribution with mean μ and variance σ^2. However, in this case there is only one draw: Earnings in all subsequent years 2,...,n are stipulated to equal earnings in the first year. Expected lifetime earnings are still $n\mu$, but the variance becomes $n^2\sigma^2$, n times greater than when earnings were independently determined in each year. This situation is one in which, ex ante, the individual is unable to determine his future position in the earnings distribution, but in which, once determined (at the outset of his career), his position in that distribution is invariant over time.

In both of these cases the variance of expected lifetime earnings ($n\sigma^2$ and $n^2\sigma^2$, respectively) is greater than the variance of earnings in any year (σ^2). In relative terms, however, the degree of risk associated with lifetime earnings is significantly smaller in the first case (independent annual draws) than in the second. Thus, the coefficient of variation (ratio of the standard deviation to the mean) is $(\sigma/\mu)/n^{\frac{1}{2}}$ if earnings are independently drawn each year, but is σ/μ for annual earnings and for lifetime earnings with a single, initial draw. Thus, the relative dispersion of lifetime earnings declines continuously with increases in the working lifetime if earnings in all years are determined independently.

Finally, a second limiting case should be mentioned. As in the case of a single draw, this limiting case dispenses with the assumption

of independence in the determination of earnings in each year. But, rather than stipulating that the position in the distribution is invariant over time, this case stipulates that any positive deviation of earnings in one year is necessarily offset by a negative deviation in some other year. In this event, the variance in lifetime earnings is definitionally zero, regardless of the variance in annual earnings. If this were the case, risk would disappear.

The foregoing independent and limiting cases provide a useful introduction to the problem of variance in lifetime earnings. The simplicity of this analysis rests upon the assumption that (a) earnings in each year are drawn from a single distribution with given mean and variance and (b) lifetime earnings are simply the undiscounted sum of annual earnings, assumptions which obviously cannot be made in the empirical analysis which follows. All three of these cases, however, can be derived more generally. Consider the random variables y_i distributed with means μ_i and variances σ_i^2. Any weighted sum of these variables $\Sigma w_i y_i$ will be distributed with mean μ_s,

$$(5.1) \quad \mu_s = \sum_i w_i \mu_i ,$$

and variance σ_s^2,

$$(5.2) \quad \sigma_s^2 = \sum_i w_i^2 \sigma_i^2 + \sum_i \sum_{j \neq i} w_i w_j \sigma_{ij} ,$$

where σ_{ij} is the covariance between y_i and y_j.

In the foregoing, in which a discount rate of zero was effectively assumed, all w_i's were by definition unity. In the more general case, w_i will be defined as $(1 + \rho)^{-i}$, where ρ is the income rate of interest, as previously discussed. The assumption of a single distribution of annual income simply stipulates that $\mu_i = \mu$ and $\sigma_i = \sigma$ for all i.

The special case of independence further stipulates that the covariances in equation (5.2) are definitionaly zero, implying that the variance of lifetime earnings is simply $n\sigma^2$. The limiting case of a single draw implies that the covariances $\sigma_{ij} = \sigma^2$ for all i and j, with the result that the variance of lifetime earnings is $n^2\sigma^2$ $[= n\sigma^2 + n(n - 1)\sigma^2]$. Finally, the case of systematically cancelling deviations over time is one in which the covariances are negative, i.e.

$$\sigma_s^2 = 0 = n\sigma^2 + n(n-1)\bar{\sigma}_{ij}$$

where $\bar{\sigma}_{ij}$ is the mean of the covariances over all i and j ($i \neq j$), implying that

$$\bar{\sigma}_{ij} = -\frac{\sigma^2}{n-1}$$

Thus, the simplified special and limiting cases can be expressed in terms of a more general model.

As discussed further below, from the estimated earnings functions for each occupation it is possible to derive mean predicted earnings at each age a, $\hat{Y}_a$, which can be employed as an estimate of the mean of earnings at that age. Similarly, it will be possible to determine

the variance of predicted earnings at that age, σ_a^2. Defining the weights w_i as $(1 + \rho)^{-(a - L)}$, where L is the lower bound of the working lifetime, all variables entering into equations 5.1 and 5.2 are known other than the covariance terms σ_{ij}. From cross-sectional data on earnings as a function of age, it is clearly impossible to determine these covariances. However, each of the previously discussed special-cum-limiting cases can be incorporated by assumption.

In all cases mean expected lifetime earnings (present value) will be given by

$$P = \sum_{a=L+1}^{U} (1+\rho)^{-(a-L)} \hat{Y}_a$$

where U is, as before the upper bound on the working lifetime.

Assuming independence of earnings over time, the covariance terms (σ_{ij}) of equation 5.2 are by definition zero, implying that the variance of the present value of lifetime earnings is

$$\sigma_p^2 = \sum_{a=L+1}^{U} (1+\rho)^{-2(a-L)} \sigma_a^2$$

In the limiting case of invariance over time in the position of an individual in the distribution of annual earnings, the covariance of earnings between any two periods is simply equal to the product of the standard deviations of earnings, i.e., $\sigma_{aa'} = \sigma_a \sigma_{a'}$ for all a and a', and the variance of the present value of lifetime earnings becomes

$$\sigma_p^2 = \sum_{a=L+1}^{U} (1+\rho)^{-2(a-L)}\sigma_a^2 + 2 \sum_{a=L+1}^{U-1} \sum_{a'=a+1}^{U} (1+\rho)^{-(a+a')+2L}\sigma_a\sigma_{a'},$$

The third case, of cancelling deviations of actual from mean earnings over time, is somewhat more complicated. In the simplified single distribution situation, the maximum absolute value of the mean negative covariance consistent with the given annual variance was that value which reduced the variance in undiscounted lifetime earnings to zero. Clearly, this limitation will continue to apply, i.e., it is impossible that the mean covariance should be so negative as to imply a "negative" variance of undiscounted earnings. Thus, the limiting value of the mean covariance is that value for which

$$0 = \sum_{a=L+1}^{U} \sigma_a^2 + [(U-L)(U-L-1)]\bar{\sigma}_{aa'},$$

or

$$\bar{\sigma}_{aa'} = -\sum_{a=L+1}^{U} \sigma_a^2/[(U-L)(U-L-1)]$$

If this is the limiting value of the negative mean covariance, then the lower bound on the variance of discounted lifetime earnings is

$$\sigma_p^2 = \sum_{a=L+1}^{U} (1+\rho)^{-2(a-L)}\sigma_a^2 + 2 \sum_{a=L+1}^{U-1} \sum_{a'=a+1}^{U} (1+\rho)^{-(a+a')+2L}\bar{\sigma}_{aa'},$$

which will be greater than zero. Substantively, the future positive (negative) deviations of actual from mean earnings will cancel previous negative (positive) deviations, but these future deviations will have a lower present value than the previous deviations, implying that the variance of discounted lifetime earnings will still be positive.

In summary, conditional on the assumption concerning the covariance of earnings over time, the mean and variance of the present value of expected lifetime earnings can be determined. Unfortunately, however, the precise distribution of this present value is not known, and for purposes discussed subsequently, the characteristics of this distribution are required. Fortunately, several of these characteristics can be inferred. Consider, first, the distribution of annual earnings. Because the earnings function expresses the natural logarithm of earnings as a function of other variables, e.g., experience, under the usual normality assumptions the distribution, predicted annual earnings will be log normal. Thus, the distribution annual earnings will be bounded below by zero and will be positively skewed. By implication, the distribution of lifetime earnings will have qualitatively similar characteristics. Although the sum (or weighted sum) of log normal variables is not itself log normal,(10) this suggests that a log normal approximation to the distribution of lifetime earnings may not be unreasonable.

Assume provisionally, then, that lifetime earnings are log normally distributed, i.e.

$$\ln P \sim N(\mu, \sigma^2)$$

Although the mean, $\bar{P}$, and variance, σ_p^2, of lifetime earnings are known, the mean, μ, and variance, σ^2, of the log of lifetime earnings must be derived. In the case of the log normal distribution it can be shown (Aitchison and Brown, 1957) that the coefficient of variation of P, η, can be expressed as a function of the variance σ^2 of ln P, i.e.

$$\eta^2 = e^{\sigma^2} - 1$$

The coefficient of variation, however, is equal to the ratio of the standard deviation of P to its mean, i.e,

$$\eta^2 = \frac{\sigma_p^2}{\bar{P}^2}$$

Thus,

$$\sigma_p^2/\bar{P}^2 = e^{\sigma^2} - 1$$

or

$$(5.3) \quad \sigma^2 = \ln\left(\frac{\sigma_p^2}{\bar{P}^2} + 1\right)$$

Given the variance of the distribution of ln P, it is possible to derive the mean of ln P from the relationship between the mean of P and the mean and variance of ln P, i.e.,

$$\bar{P} = e^{\mu} + .5^{\sigma^2}$$

$$\mu = \ln \bar{P} - .5\sigma^2$$

Thus, subject to the assumption that the distribution of lifetime earnings is logarithmically normal, the characteristics of that distribution have been determined, conditional on the stipulated covariance of earnings over time.

It is now possible to turn from the objective question of the dispersion of expected lifetime earnings to the subjective question of the individual's preferences concerning more versus less risky alternatives. The point here is that a risk-averse individual might well prefer an occupation with lower expected lifetime earnings if the variance of these expected earnings were also sufficiently lower than that associated with alternative available occupations.

To take risk into account effectively requires that expected lifetime earnings be distinguished from the expected utility of lifetime earnings. It is assumed here that the individual's utility function (for purposes of evaluating risk) is characterized by what Arrow (1965) has referred to as constant relative risk aversion, implying a utility function of the form(11)

$$(5.5) \quad U(P) = \frac{P^{1-\alpha}}{1-\alpha}, \ \alpha \neq 1,$$

$$= \ln P \ , \ \alpha = 1,$$

where α is the index of relative risk aversion.

In this formulation, $\alpha = 0$ indicates risk-neutrality ($\partial U/\partial P = 1$), $\alpha > 0$ indicates risk aversion ($\partial U/\partial P < 1$), and $\alpha < 0$ indicates risk preference ($\partial U/\partial P > 1$).

On the assumption that P is distributed lognormally, it follows

$$(5.6) \quad \bar{U} = E(U) = \frac{1}{1-\alpha} e^{(1-\alpha)\mu + .5(1-\alpha)^2\sigma^2}, \alpha \neq 1,$$
$$= \mu , \alpha = 1.$$

Then, if individuals are risk averse, the appropriate measure of the returns to the choice of occupation i over occupation j is $\bar{U}_i - \bar{U}_j$, not the difference in expected lifetime earnings in occupation i and j , $\bar{P}_i - \bar{P}_j$.

If the income rate of interest refers to a riskless alternative, then

the net utility capital value, $\bar{U}_i - \bar{U}_j$, captures

the influences of the risks associated with both alternatives.

Thus, the net utility capital values of returns to the choice of one occupation over another can be determined for alternative assumed degrees of risk aversion (values of α), providing a spectrum of estimated utility capital values. Unlike the net capital values themselves, which are expressed in constant dollars, the unit of utility measurement has no intuitive meaning. Therefore, in the empirical analysis, these are expressed relative to the utility of expected lifetime earnings in the subject occupation, i.e., as $(\bar{U}_i - \bar{U}_j)/\bar{U}_i$, providing an indication of the relative departure from perfectly competive market equilibrium (for which $\bar{U}_i - \bar{U}_j$ would equal zero), conditional on the stipulated degree of relative risk aversion.

Another approach the question of risk aversion and market equilibrium is to ask the following question: Given an observed difference in expected lifetime earnings between occupations i and j, how risk-averse (-seeking) would an individual have to be in order to be indifferent between the two occupations? In other words, what degree of risk aversion would be required if the observed differential were to be consistent with market equilibrium?(12)

This question can be answered by setting $\overline{U}_i$ equal to $\overline{U}_j$ each as a function of μ , σ^2 and α as specified in equation 5.6) and solving for α , with the result that

$$(5.7) \qquad \alpha = \frac{\mu_i - \mu_j}{.5(\sigma_i^2 - \sigma_j^2)} + 1$$

The plausibility of the resultant value of α would then provide an indication of the consistency of the observed lifetime earnings differential with the existence of competitive equilibrium.

Finally, iterating on the value of the income rate of interest, ρ, that value of ρ consistent with $\overline{U}_i = \overline{U}_j$ could be determined, conditonal on any stipulated degree of risk aversion α . This value would then be the risk-cognizant internal income rate of return to the selection of occupation i over occupation j.

Thus, each of the measures of returns to occupational choice which can be derived ignoring risk (the net capital value differential and the internal rate of return) has a direct parallel when the effects of risk aversion are recognized.

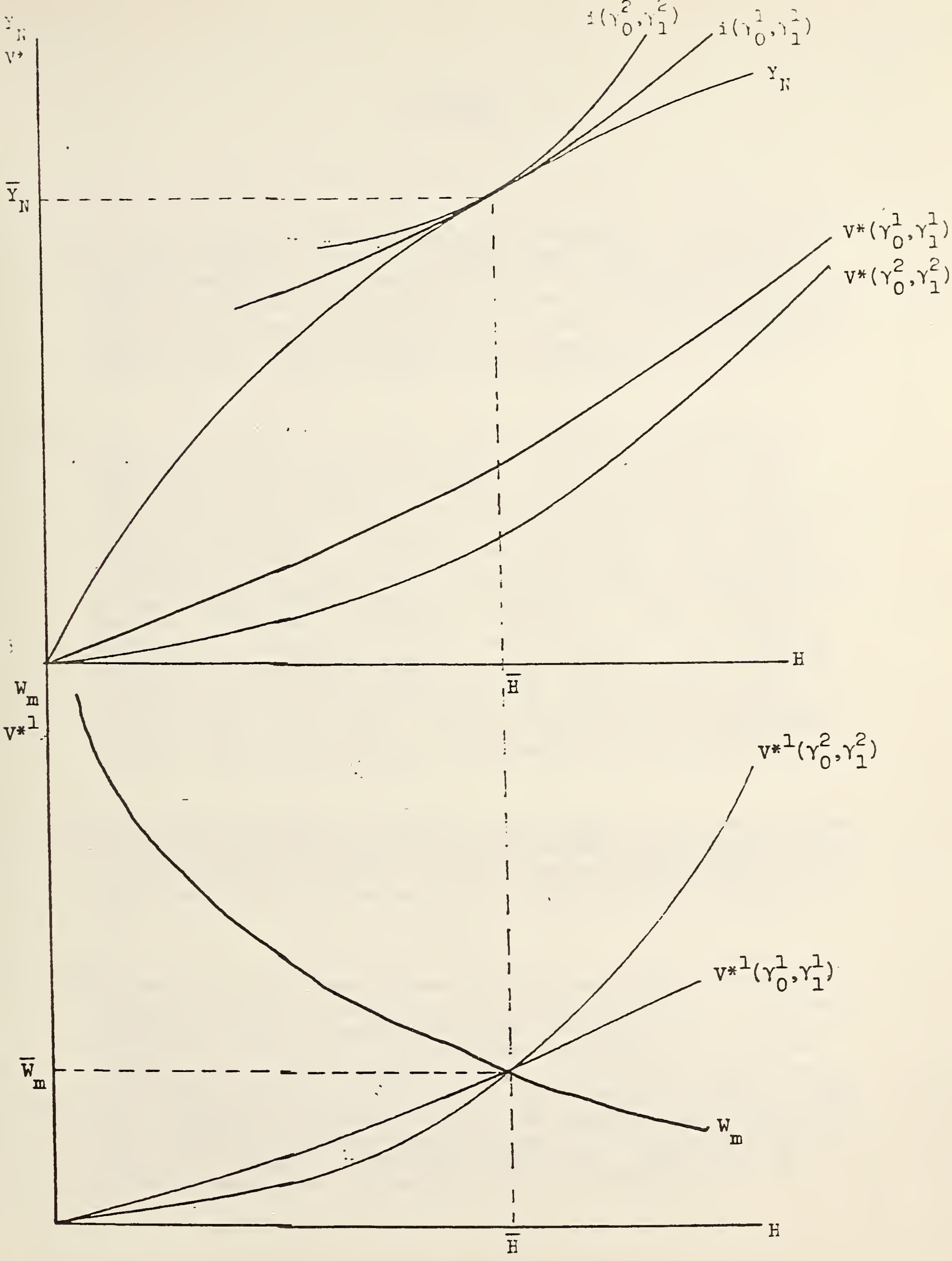
Y_N
V^*
$i(\gamma_0^2,\gamma_1^2)$
$i(\gamma_0^1,\gamma_1^1)$
Y_N
$\overline{Y}_N$
$V^*(\gamma_0^1,\gamma_1^1)$
$V^*(\gamma_0^2,\gamma_1^2)$
H
$\overline{H}$
W_m
V^{*1}
$V^{*1}(\gamma_0^2,\gamma_1^2)$
$V^{*1}(\gamma_0^1,\gamma_1^1)$
$\overline{W}_m$
W_m
H
$\overline{H}$

Figure 3.1

FOOTNOTES

(1) Although the latter is not a necessary consequence of the former, as, for example, if the individual labor supply function is backward-bending (the income effect of the higher wage rate outweighs the substitution effect), it can be demonstrated that the relationship between the wage rate and hours of work is necessarily positive if all labor-cum-human- capital markets are in long-run equilibrium (in which case there is no income effect).

(2) It is not obvious, a priori, that systematic differences in preferences which would be observed in the absence of entry restrictions would also be observed in the face of such restrictions. This would be the case only if selection criteria for rationed entry were correlated with individual income-leisure preferences. However, if the "gate-keepers" act so as to maximize the aggregate real rents to the occupations members, then they will systematically select entrants on the basis of these preferences. The same effect may be achieved indirectly. Thus, if the probability of obtaining entry is contingent on, e.g., academic performance, if academic performance is a function of time devoted to study, and if time devoted to study is associated with or reflects the marginal disutility of work, then successful applicants for entry will, on average, exhibit lesser disutility associated with work than will unsuccessful applicants or non-applicants.

(3) For example, earnings of academic faculty might be a linear function of publications, measured, e.g., in pages. But if pages produced per hour decline with increases in hours, then the marginal wage rate of the academic will decline and will be less than his average wage rate.

(4) Reinhardt distinguishes between two distinct classes of own-time inputs into medical practice, medical and administrative. Although this distinction is important for some purposes, e.g., for explaining the failure of physicians to maximize net income conditional on their total time input or to underutilize purchased inputs into practice (due in both cases to the greater disutility of time devoted to administration and to complementarity between purchased inputs and administrative time), the distinction does not alter the general conclusions reached here concerning the determinants of hours and earnings over the lifecycle.

(5) If current levels of competancy-enhancing activity are assumed to influence demand and/or productivity only in the future, then ignoring it will have no influence on the solution if this activity is so distinct from conventional practice activity that it enters the utility function additively, i.e., if

$$V = Y_N - V^*(H_p) - V^{**}(H_m)$$

Past levels of competency-enhancing activity and learning-by-doing in the course of past practice activity, however, will enter into the demand and production functions through the variables Z_2 and Z_3. If the solution of the optimal control problem discussed earlier revealed, under reasonable assumptions, that the optimal allocation of time in this activity is systematically related to experience (years of practice), then its current level would serve at least partially to identify its entire past history. Specifically, it is probably the case that the optimal path of H_m with experience is a function of (a) the depreciation rate, (b) the market interest rate, (c) the subjective discount rate, and (d) the change in the instantaneous utility function (specifically, the marginal disutility of labor) with age. Assumptions concerning each of these factors would then permit the current level of H_m to determine, first, its entire past path and, second, the depreciated current stock of such capabilities. However, in the absence of an explicit solution to the optimal control problem, it is impossible to specify concretely the manner in which this dimension of the problem should be incorporated. Thus, for immediate purposes this activity and its consequences for earnings and utility are ignored.

(6) Direct estimation of a net earnings function is also necessary if returns to physician training are to be determined. Primary sources of data on earnings of non-physicians permit only the estimation of net earnings functions. Thus, comparability between the earnings function estimates for physicians and non-physicians requires recourse to the simplified formulation.

(7) As discussed below, this is a simplification of the more complex hours-experience interactions permitted in the empirical analysis. However, this simplification facilitates the present discussion without abstracting from the central issue.

(8) The second of these restrictive assumptions will be relaxed in the empirical analysis of returns to medical specialization by inclusion in the earnings function of age at medical school graduation.

(9) The only systematic attempt to take into account the effect of risk on returns to occupational choice is provided by Weiss (1972). However, as Hause (1974) has pointed out, Weiss's analysis is fatally flawed by its focus on annual earnings variability rather than on the variability of lifetime earnings. Specifically, Weiss determines the utility of earnings at each year of age, given (a) the mean and variance of earnings at that age and (b) a stipulated degree of risk aversion. This has the effect of greatly understating the returns to the choice of occupations characterized by high year-to-year income variations relative to occupations not so characterized, e.g., to occupations dominated by the selfemployed relative to those dominated by salaried employment.

(10) Rather, the product of log normal variables is log normal.

(11) An interesting discussion of the properties and implications of this utility function is provided by Samuelson (1971).

(12) This is a variation on the type of question addressed by Crain and Zardkoohi (1980), who were concerned with the nonpecuniary benefits required in alternative occupations as a condition for equilibrium.

Part II

Cross-Sectional Analysis of Returns to Physician Training and Specialization

6. ESTIMATED PROFESSIONAL EARNINGS FUNCTIONS

In this section a more complex version of the net earnings function presented in equation 3.8 is estimated for 15 professional occupation groups, utilizing the 1977 Current Population Survey Annual Demographic File (CPS) which provides information on individual hours and earnings for the calendar year 1976. In the following section these estimated earnings functions are employed to estimate returns to physician training and the choice of a medical career.

The general form of the estimated net earnings function is

$$(6.1)\quad Y_N = H^{\alpha_0 + \alpha_1 E + \alpha_2 E^2} e^{\beta_0 + \beta_1 E + \beta_2 E^2 + \beta_3 H + \beta_4 HE + \beta_5 HE^2 + \beta_6 X}$$

The advantage of this generalized form is that it permits a highly flexible relationship between the marginal wage rate, hours of work and earnings, with the marginal wage rate

$$(6.2)\quad w_m = \frac{\partial Y_N}{\partial H} = \{ (\alpha_0 + \alpha_1 E + \alpha_2 E^2) H^{-1} + (\beta_3 + \beta_4 E + \beta_5 E^2) \} Y_N$$

In this formulation over various phases of the working lifetime the marginal wage rate may rise or decline with increased hours of work, and experience may serve to raise or lower the marginal wage rate, not necessarily equiproportionately at all levels of hours.

Because of the complexity and multiplicity of the effects of hours and experience on marginal wage rates, collinearity of the various experience and hours terms and interactions precludes estimation of the model in its most general form. Thus, the estimated models in each case represent more or less parsimonious versions of the general model. All empirical applications include estimation of α_0, β_1 and β_2. The coefficient β_3 is included only if it is found to be statistically significant, except as noted below.

statistically more significant pair of coefficients was estimated, conditional of the finding of significance of at least one pair. If β_4 and β_5 were estimated, β_3 (the coefficient of hours) was estimated even if it was found not to be significant.

At the outset the exploratory nature, qualifications and limitations of the empirical analysis should be stressed. As in the case of all earnings functions estimated from cross-sectional data, the estimates of "lifecycle effects" (experience and experience-hours coefficients) may confuse true lifecycle and cohort effects. Also, as noted previously, in estimating the earnings functions hours of work, experience and other explanatory variables are assumed to be exogenously determined. In fact, many of these variables are determined simultaneously with, and in response to their effects on, earnings. Thus, the estimated coefficients are subject to simultaneous equations bias. Although the direction and degree of bias is unknown, its probable presence should be kept in mind. Notwithstanding these qualifications, the results should indicate the importance of explicitly taking into account the variation in marginal earnings with hours and experience and should confirm the untenability the conventional assumption of a constant, average-equal-to-marginal wage rate.

In order to achieve adequate sample sizes, the detailed Census professional, technical and managerial occupations (identified by 1970 Census occupation codes) were grouped into fifteen aggregate occupation groups, the composition and characteristics of which are summarized in Table 6.1. With the exception of natural scientists and health technicians, for which sample sizes of 152 and 68, respectively, were obtained, this aggregation resulted in sample sizes of in excess of 200.

Because of severe collinearity it was impossible in all cases to estimate both pairs of coefficients (α_1, α_2) and (β_4, β_5) simultaneously. Thus, the

On the assumption that earnings within an occupation are distributed, at least approximately, according to the log normal distribution, the log of median earnings will be roughly equal to the mean of the log of earnings. Thus, Table 6.1 presents the approximate median earnings by occupation, obtained by evaluating the mean of the log of earnings. To indicate the dispersion of earnings within each occupation, the mean of the log, plus and minus one standard deviation, is also evaluated (in parentheses); again on the assumption of a log normal distribution, this range will include approximately two-thirds of the observations.

As can be observed, earnings vary substantially both across and within occupations. Median earnings range from $10,168 for health technicians and $13,319 for trade-related managers to $21,973 for lawyers and $34,746 for physicians. Using the ratio of the upper to lower bounds of the plus and minus one standard deviation range as an indicator of the dispersion of earnings within an occupation, the degree of intra-occupational variation ranges from 2.1 for computer and mathematical specialists to 8.1 for trade-related managers. This measure (denoted INDEX) and the standard deviation of the log distribution (an approximate proportionality measure), ranked from lowest to highest, are:

	INDEX	LOG STAN. DEV.
Computer and mathematical specialists	2.1	.37
Engineers	2.2	.37
Non-college teachers	2.2	.39
Health and education administration	2.2	.40
Engineering and science technicians	2.3	.42
Bank officers	2.5	.47
Public administrators	2.6	.49
Accountants	2.8	.52
Health Technicians	2.9	.52
College faculty	2.9	.54
Physicians	3.0	.54
Natural scientists	3.8	.66
Misc. managers and officials	7.6	1.02
Lawyers and judges	7.7	1.02
Trade-related managers	8.1	1.05

Because sales-related occupations have been excluded, the occupational groups are concentrated at the lower end of the intra-occupational variance distribution.

Annual hours of work, for which means and standard deviations are also reported in Table 6.1, exhibit similar between and within occupation variability. Mean hours range from 2149 for engineering and science technicians and 2163 for public administrators to 2494 for miscellaneous managers and officials and 2829 for physicians. As measures of intra-occupation variation in hours, standard deviations are highest for physicians (790) and college faculty (678) and are lowest for computer and mathematical specialists (294) and public administrators (275).

This gross variability in earnings and hours, while of potential interest, fails to account for the covariance of hours and earnings and for variations in schooling, experience and age, etc. For this purpose it is necessary to turn to the estimated earnings functions, presented in Table 6.2. The dependent variable in each case is the natural logarithm of reported earnings in 1976. Explanatory variables potentially included in the estimated functions are

Annual hours (in thousands) (ln)
Annual hours (" ")
Experience (Age minus years of schooling minus six, in decades)
Experience squared
Experience--log of hours of interaction
Experience squared--log of hours interaction
Experience--hours interaction
Experience squared--hours interaction
Weeks worked (ln)
Years of schooling attended
Dummy variable for completion of 16 or more years of school
Years of school attended, conditional on completion of 16 or more
Dummy variable for self-employment
Dummy variable for SMSA residence
Dummy variable for SMSA central-city residence.

The self-employment and various years of schooling variables were included only when significant intra-occupational variation in these variables was observed.

Considering that these earnings functions are estimated on the basis of cross-sectional observations, the explanatory power of the estimated equations is remarkably high, with coefficients of determination (R^2) ranging from 0.63 (college faculty) to 0.17 (trade-related managers). Only in the last case does the R^2 fall below 0.3, and for seven of the 15 occupational groups the R^2 exceeds 0.4.

Surprisingly in light of cost-of-living and other urban-rural differences, the SMSA residence dummy variable is not significant (at the five percent level) for engineers, lawyers, natural scientists, physicians, health technicians, engineering and science technicians, and computer and mathematical specialists. Less surprisingly, since it relates to residence rather than place of work, the central city dummy variable is rarely significant.

The self-employment dummy variable is significantly negative for both miscellaneous and trade-related managers. For physicians, lawyers and accountants, this variable is totally insignificant. Thus, there is no evidence in these data that mode of practice influences professional earnings.

Interestingly, having controlled for occupation there is evidence of only attenuated returns to schooling. Years of schooling is significant for engineers, college faculty, other teachers, engineering and science technicians, miscellaneous managers, trade-related managers, and computer and mathematical specialists, with returns to a year of schooling ranging between a three and eight percent gain in annual earnings for these occupational groups. Completion of schooling beyond the collegiate level has a

significant differential effect on earnings only for public administrators, bank officers and health and educational administrators. In these three occupations, however, there is no return to schooling below the college-completion level.

Although individual hours, experience and hours-experience interaction variables are occasionally insignificant, in general these variables exhibit high levels of statistical significance. The log of hours, included in all equations, is insignificant only for natural scientists, physicians and bank officers. However, for physicians and bank officers the hours-experience interaction variables are highly significant. One or both of the interaction variables is also significant for lawyers, college faculty, other teachers, and miscellaneous managers. Either hours (non-logged) or the hours-(non-logged) experience interaction variables are significant for accountants, lawyers, physicians, college faculty, other teachers, science and engineering technicians, public administrators, health and educational administrators, miscellaneous and trade-related managers and computer specialists, for all of which the elasticity of earnings with respect to hours declines with increases in annual hours of work. Thus, a constant elasticity is observed only for engineers, natural scientists, health technicians, bank officers. However, only for health technicians is an elasticity of unity observed (implying a constant marginal equal to average wage). In all other cases, the marginal and average wage rates decline with increases in hours of work. at least over the relevant range.

Because of the multiplicity of hours, experience and schooling variables in the estimated equations, significance tests of individual coefficients fail to indicate the joint significance of the various variables in each of these groups. For this purpose, Table 6.3 provides joint significance tests of (a) all variables incorporating annual hours, (b) all

variables incorporating experience, and (c) all variables incorporating years of schooling. Hours-experience interaction terms, in any form, are included in both of the first two tests. In the case of lawyers and physicians, for which no variance in schooling was observed, the third test is not performed.

Together, the hours variables are highly significant for all occupations other than natural scientists and physicians, and for the former the schooling variables are also jointly insignificant. Schooling variables are insignificant for health technicians as well, and for this occupation the experience variables are jointly significant at only the four percent level. In all other cases the joint tests indicate significance at less than the one percent level.

As expected, in all cases the experience variables (either alone or interacting with the hours variables) imply earnings which at first increase and then eventually decline with experience.

Variation in the marginal wage rate and in earnings with (a) annual hours and (b) age and experience is examined in Tables 6.4-1 through 6.4-15. Since experience is proxied by age and years of schooling, labor force experience is assumed to begin at age 21 for persons with 14 years of schooling, at age 23 for persons with 16 years of schooling and at age 27 for persons with 20 years of schooling. For purposes of evaluating the earnings function, the modal years of schooling completed in each occupation has been assumed. Also, the hypothetical individual is assumed to work 50 weeks per year and is a non-central-city resident of an SMSA. Self-employed, observed in the case of 51 percent of lawyers and 60 percent of physicians, is assumed for these two occupations.

Tables 6.4-i (i = 1,...,15) first indicate the hours which are estimated to be worked at each year of age. Thus, for example, a 30 year old physician (Table 6.4-5) is actually estimated to work 2916 hours per year. The next column indicates the marginal wage rate at the estimated actual level of hours (first row at each age) and predicted total earnings (second row). Thus, a 30 year old physician working 2916 hours in 1976 is predicted to have a marginal wage of $-1.93 and to receive total earnings of $24,490. The following columns indicate the marginal wage rate and total earnings which would be predicted at each age, if annual hours of 1600, 2000, 2400, 2800 and 3000 were worked. Thus, the 30 year old physician's marginal wage rate would decline from $4.12 at 1600 hours to $1.53 at 2400 hours and to $-2.12 at 3000 hours, while his earnings would first rise and then decline. The final row of the table indicates the present value of lifetime earnings at the estimated and alternative assumed levels of annual hours, discounting at a rate of five percent per year to age 18. Thus, the present value of physician lifetime earnings at the estimated actual hours is $432,528, while a physician who worked 1600 hours each year would have lifetime earnings with a present value of $367,856.[1]

To indicate the effects of variations in levels of schooling on marginal wage rates, at various levels of hours and ages, Table 6.5, presents marginal wage rates at three ages (30, 45 and 60) for the three hypothetical schooling levels (12, 16 and 20 years), at each of three levels of annual hours (1900, 2300 and 2700). While increases in schooling invariably increase marginal earnings at more advanced ages (although slightly in many cases), the negative effect of schooling on experience often results in declines in marginal wage rates at younger ages.

Perhaps the most startling finding is the extremely low marginal wage rate confronted by physicians. At the estimated actual hours the physician's marginal wage is lower at all ages than that of lawyers, health technicians, engineering and science technicians, public administrators, trade-related managers and computer and mathematical specialists. The highest marginal wage rates are clearly those of lawyers, which exceed $20 per hour between the ages of 40 and 50. By comparison, the physician wage rate rises from $3.70 at age 40 to $5.28 at age 50. As will be discussed below, this finding of an extremely low marginal wage rate of physicians will also be found for individual medical specialities.

One seemingly anomalous finding deserves specific note. This is the negative marginal wage rate at the estimated hours observed in the cases of older accountants and young and old physicians. There is no conceptual difficulty associated with a negative marginal wage rate. Efficiency has fallen so low that total output actually declines, the demand curve for the individual's services is inelastic (e.g., an older practitioner whose established clientele is contracting, requiring that he cut fees drastically in order to obtain patrons to occupy his usual working hours), or the need for inputs other than own time has begun to rise more than proportionately with increases in hours. These explanations may well apply to the finding of a negative estimated marginal wage for older accountants and physicians.

However, these explanations do not seem compelling with reference to the negative marginal wage rates estimated for younger physicians. Here the marginal wage rate at the estimated actual level of hours is negative for the first seven years after the receipt of a medical degree, becoming negative at between 1600 and 2000 hours at age 27, 2000 and 2400 hours at ages 28 to 30, and 2400 and 2800 hours at ages 31 to 33.

Because of the characteristics of the CPS data, it is not possible to identify the precise status of a young physician. At these ages, however, it is reasonable to assume that the physician is in fact in training. In fact, the absolute levels of earnings observed, e.g., $18,900 at age 27 and $24,940 at age 30, are consistent with this conjecture. Thus, it is more plausible to suggest that the negative marginal wage reflects a choice of activity and hours which involves a trade-off between current and future earnings. In exchange for a current sacrifice of earnings and leisure, the young physician obtains training which will produce a higher future earnings flow. Obviously, only with longitudinal data would it be possible to explicitly test this hypothesis, but the observation of a negative marginal wage rate indicates the importance of explicitly taking into account time devoted to skill formation, as discussed above in the context of the general lifecycle model.

As noted, Table 6.5 summarizes the effects of hours, age (and experience) and schooling on marginal wage rates. Holding hours constant, marginal wages rise and then decline with age in all occupations other than college and non-college teaching and miscellaneous managers, for which a decline and then rise is observed. In all cases other than health technicians (for which the marginal wage is effectively constant) marginal wage rates decline with increases in annual hours worked.

Changes in earnings over the lifecycle represent the consequence of simultaneous changes in hours of work and marginal wage rates. These changes are summarized in Table 6.6, which indicates, by occupation, (a) the age at which earnings reach their peak, (b) hours, earnings and the marginal wage rate at that age, and (c) ratios to these of their values at ages 30 and 65.

Earnings in these occupations peak between the mid 40's and mid 50's, with the peak coming latest for college faculty (at age 56) and earliest for health technicians (at age 43). In general, earnings at age 30 range between two-thirds and three-quarters of peak earnings, but for natural scientists, physicians, lawyers and college faculty much greater lifecycle earnings growth is observed between age 30 and the peak.

If annual hours were held constant (at 2400), with two exceptions (accountants and health and education administrators) earnings would peak later than the ages actually observed, generally by two to four years. Thus, the earlier observed peak results from a decline in hours which begins sometime before the age of peak earnings at constant hours. Hours are very similar at age 30 and at the age of peak earnings, but between age of peak earnings and age 65 hours decline in all occupations other than college faculty, natural scientists and engineers. Marginal wage comparisons between age 30, age of peak earnings and age 65 show much more diverse patterns, although the general pattern (violated by college faculty, other teachers, health and education administrators and miscellaneous managers) is for the marginal wage rate to rise between age 30 and age of peak earnings. Between the age of peak earnings and age 65 marginal wage rates decline in seven occupations and rise in eight.

In summary, lifecycle earnings patterns clearly differ significantly across occupations, with widely varying and complex relationships observed between earnings, experience and hours of work. Unless these differences are explicitly recognized, no meaningful comparisons of earnings experience across occupations are possible.

7. ESTIMATES OF RETURNS TO THE CHOICE OF PHYSICIAN TRAINING RELATIVE TO ALTERNATIVE PROFESSIONAL OCCUPATIONS

The estimated earnings functions provide the basis for a range of alternative estimates of the returns to physician training and the choice of a medical career. The measure of returns utilized here is the present value (at age 18) of the earnings differentials observed over the working lifetime between the representative physician and the representative incumbent in any alternative occupation. It is assumed that prior to the completion of schooling earnings are in fact zero. Thus, the foregone earnings associated with the choice of a career requiring lengthier schooling are taken into account in the estimates. Because physician training requires schooling at least equal in duration to that associated with any other occupation, the failure to take into account any earnings prior to completion of schooling will impart a downward bias to estimated returns to physician training.

Although incorporating foregone earnings, these gross estimates are unadjusted for other schooling costs, e.g., tuition, fees, books, laboratory supplies. Note, however, that since foregone earnings implicitly have been incorporated, no adjustment of the resulting estimates is necessary for room, board and other living expenses. Thus, the present values are gross estimates unadjusted only for the out-of-pocket costs of schooling per se. This adjustment will be incorporated below.

A range of alternative estimates of gross returns are provided; under varying assumptions concerning the discount rate and incorporating alternative mortality adjustments. Because the earnings functions are estimated from cross-sectional data, the discount rate corresponds to what Tobin (1971) has referred to as the "income rate of interest." If earnings profiles shift upward over time due to (real or inflationary) secular income growth, then the nominal earnings experience of a representative individual will be

characterized by successively higher-points (due to increased age and experience) on progressively higher earnings profiles (due to secular earnings growth). Consider a person with a years of experience in the base period (t=0) earning Y_{ao}. If nominal earnings (at all levels of experience) are increasing at a secular rate d, then the nominal earnings of an individual with a years of experience who enters the labor force at time t=1 will be

$$Y_{ao} (1 + d)^{a}$$

The present value of these earnings at time t=0 discounting at a nominal interest rate R, will be

$$PV_{ao} = \left(Y_{ao} (1 + d)^{a}\right) (1 + R)^{-a}$$
$$\simeq Y_{ao} (1 + R - d)^{-a} = Y_{ao} (1 + r)^{-a}$$

where $r = R - d$ is the income-growth-adjusted discount rate.

The use of r, then, permits one to abstract from or to ignore, the rate of secular increase in nominal earnings. Thus, if an income-growth-adjusted rate (r) of five percent is assumed, this would correspond to a nominal discount rate (R) of 15 percent if a rate of secular income growth (d) of 10 percent is assumed. For present purposes, income-growth-adjusted discount rates of five and ten percent are utilized.

Mortality effects raise more serious issues. Age-specific mortality rates differ significantly across occupations. While mortality rates are generally significantly lower in professional occupations than for the population at large, great differences are observed across professions, as indicated by the profession-specific standard mortality ratios (SMRs), effectively equal to (100 times) the average (ages 20 to 64) age-specific mortality rates of the particular profession relative to the average age-specific mortality rate of the white male 20 to 64 years old population

(weighting in both cases by the age distribution of the profession's incumbents). These standard mortality ratios for the professional occupations considered here are:[2]

	SMR
Accountants	94
Engineers	73
Lawyers and judges	90
Natural scientists	56
Physicians	91
Health technicians	109
College faculty	52
Teachers (ex college)	61
Engineering and science technicians	73
Public administrators	68
Bank officers	81
Health and education administrators	68
Miscellaneous managers and officials	86
Trade-related managers	98
Computer and math specialists	56

The issue is whether these occupation-specific mortality adjustments should be incorporated in the estimation of returns to occupational choice. If the entire difference in mortality experience were attributable to occupation per se, then this would be an appropriate procedure. However, to a greater or lesser extent these differences in mortality experience undoubtedly reflect the selection or self-selection into occupations of persons with occupation-independent mortality probabilities which differ systematically from those of the population at large and from those of entrants into alternative occupations.

If in fact ex ante mortality probabilities differ significantly across entrants into alternative occupations, then it is probably also the case that mortality expectations of marginal entrants into an occupation will tend toward those of the population at large. Because occupations differ in the lifecycle profile of earnings, it is clearly necessary to adjust expected future earnings for survival probabilities, but the derivation of appropriate survival probabilities is amgibuous.

For the representative incumbent in an occupation, the issue is one of ex post occupational versus ex ante selection differences in mortality/survival prospects. At one extreme, if observed inter-occupational differences in mortality are causally related to occupation, the lifetime earnings in each occupation should be adjusted for that occupations mortality experience. If the effects derive entirely from selection into alternative occupations of persons with systematically different mortality prospects then the returns to choice of occupation j over i for an j incumbent should be estimated on the basis of earnings in both i and j adjusted for j mortality. For the marginal entrant, if the observed mean differentials are due to selection, while the marginal entrant's prospects converge toward those for the population, an occupation-independent adjustment would be appropriate.

To indicate the effects of mortality adjustments on estimated returns to physician training, three alternative sets of estimates are developed here. The first incorporates no adjustment for mortality. On the assumption that the marginal entrant into medicine has ex ante mortality prospects corresponding to the population at large, and that observed inter-occupational differences in mortality are due entirely to selection, the second adjusts earnings in medicine and in all alternative occupations for age-specific mortality of the white male population. Finally, the third assumes that observed inter-occupational differences in mortality are due entirely to the effects of occupation, and earnings in each occupation are adjusted for the mortality experience of its incumbents. To limit the number of comparisons, these alternatives are presented only for a discount rate of five percent. Estimates utilizing a discount rate of ten percent assume occupation-specific mortality and thus correspond to the last of the above estimates

As discussed in detail above, the critical issue in the derivation of estimated return to schooling and occupational choice involves the appropriate treatment of hours-of-work differentials. Ideally, one would determine the hours which the representative utility-maximizing physician would choose to work in any alternative occupation and utlize the earnings associated with this hypothetical level of hours in determining the returns to the choice of medicine over the alternative occupation. An exploratory variant of this approach is in fact utilized in the following sections to assess returns to alternative medical specialty choices. Because of difficulties encountered by that approach when negative marginal wage rates are observed, the CPS-based analysis employs a more conventional approach.

The most common estimates of returns to occupational choice make no adjustment for hours of work differentials. In effect, these estimates are obtained by discounting and summing the estimated earnings differentials at each age

$$V_{ij}^{U} = \sum_{a=L}^{U} (S_{iLa} \overline{Y}_{Nia} - S_{jLa} \overline{Y}_{Nja}) (1 + r)^{-(a - L)}$$

where	L	represents the lower bound of the working lifetime,
	U	represents the upper bound of the working lifetime,
	a	is age,
	r	is the discount rate,
	S_{iLa}	is the probability that an occupation i incumbent will survive from age L to age a (equal to one for all a in the mortality-unadjusted estimates, to that of the population at large when inter-occupational differences are assumed to be noncausal, and to occupation-specific survival when occupation is assumed to be causal).

Y_{Nia} is estimated net earnings in occupation i at age a, and

Y^{U}_{ij} is the estimate of the gross capital value at age L of the choice of occupation i over occupation j, unadjusted (superscript U) for hours of work differentials.

The most common hours-of-work adjusted measures found in the literature simply proportionately adjust earnings in one of the two occupations for estimated hours of work differentials, assuming that earnings are a linear function of hours. A Paasche adjustment scales earnings in the alternative occupation j for the i, j hours of work differential, resulting in the estimate

$$V^{ALP}_{ij} = \sum_{a=L}^{U} (S_{iLa} \overline{Y}_{Nia} - S_{jLa} \overline{Y}_{Nja} \frac{\overline{H}_{ia}}{\overline{H}_{ja}}) (1 + r)^{-(a - L)}$$

where $\overline{H}_{ia}$ is estimated hours in occupation i at age a, and V^{ALP}_{ij} is the adjusted (superscript A) capital value estimate assuming linearity (superscript L) of earnings with hours and incorporating a Paasche (superscript P) adjustment for hours differentials. Because the representative worker in occupation j could, if he wished, work $\overline{H}_{ia}$ hours, in any year this measure will provide an upward-biased estimate of differential earnings in occupation i, assuming that earnings are in fact a linear function of hours.

The corresponding Lespeyre adjustment, still assuming linearity of earnings as a function of hours, involves scaling earnings in occupation i by the i, j hours of work differential, resulting in the estimate

$$V^{ALL}_{ij} = \sum_{a=L}^{U} (S_{iLa} \overline{Y}_{Nia} \frac{\overline{H}_{ja}}{\overline{H}_{ia}} - S_{jLa} \overline{Y}_{Nja}) (1 + r)^{-(a + L)}$$

where V^{ALL}_{ij} is the adjusted capital value estimate assuming linearity of earnings with hours and incorporating a Lespeyre (final superscript L) adjustment for hours differentials. Because the representative worker in i is also free to work $\overline{H}_{ja}$ hours if

he wishes, this estimate in any year will incorporate a downward biased estimate of earnings differentials, ignoring wealth effects, at least on the assumption of hours-earnings linearity.

If earnings are in fact not linear function of hours, then these two adjusted estimates may both be seriously biased. In fact, nonlinearity of earnings with respect to hours has been found to be the dominant pattern in the professional occupations examined. Thus, more appropriate measures can be obtained by explicitly taking into account this observed nonlinearity.

The nonlinear (superscript N) Paasche-adjusted estimate is

$$V_{ij}^{ANP} = \sum_{a=L}^{U} (S_{iLa}\, \overline{Y}_{Nia} - S_{jLa}\, \overline{Y}_{Nja(\overline{H}_{ia})})\ (1 + r)^{-(a - L)}$$

where $\overline{Y}_{Nja}\ (\overline{H}_{ia})$ is given by the evaluation of the estimated earnings-function for occupation j at estimated hours in occupation i, and

V_{ij}^{ANP} is the adjusted, nonlinear Paasche estimate of the capital value of the choice of occupation i over j.

As in the case of the linear Paasche estimate, this measure will be based on an upward biased estimate of the differential in any year.

The alternative Lespeyre-adjusted nonlinear estimate is

$$V_{ij}^{ANL} = \sum_{a=L}^{U} (S_{iLa}\, \overline{Y}_{Nia(\overline{H}_{ja})} - S_{jLa}\, \overline{Y}_{Nja})\ (1 + r)^{-(a - L)}$$

where V_{ij}^{ANL} is the adjusted nonlinear Lespeyre capital value estimate. Also, as in the case of the linear Lespeyre estimate, this measure will rest upon a downward biased estimate of the differential in any year.

Table 7.1 presents the alternative gross capital value estimates, comparing physicians (occupation i) to each of the alternative CPS occupations (occupation j), assuming a five percent discount rate and ignoring mortality.

Population mortality (white males) is incorporated in Table 7.2, while Table 7.3 adjusts expected earnings in each occupation for occupation-specific mortality.

The most important conclusion from these estimates of the gross capital values of the choice of a medical career is that, regardless of the mortality adjustment, the nonlinear hours-adjusted estimates, V^{ANP} and V^{ANL}, correspond much more closely to the unadjusted estimate, V^{U}, than to the linear hours-adjusted estimates, V^{ALP} and V^{ALL}. In most cases the nonlinear hours-adjusted estimates are less than 25 percent smaller than the unadjusted estimates, as can be seen in Figure 7.3 for the occupation-specific mortality adjusted estimates. In contrast, the inappropriate linear hours-adjusted estimates, also displayed in Figure 7.3, are frequently less than one-half as great as the unadjusted estimates.

Utilizing the linear adjustment, the gross capital value of returns would unambiguously fall below $20,000 by comparison to two alternative occupations (lawyers and computer and mathematical specialists) and would be greater than $100,000 only by comparison to four alternative occupations (non-college teachers, college faculty, natural scientists, and health technicians). In contrast, the nonlinear hours adjustments suggest substantially greater returns. By comparison to lawyers, physician returns would increase from over $10,000 to over $52,000 (Lespeyre linear and nonlinear, respectively) and from over $8,000 to in excess of $17,500 (Paasche linear and nonlinear, respectively). In comparison to computer and mathematical specialists, estimates of physician returns would increase from less than $20,000 (linear) to almost $100,000 (nonlinear).

Interestingly, although the Paasche estimate of differential earnings represents an overestimate of the true differential, while the opposite is the case with reference to the Lespeyre estimate, the Lespeyre estimate of the gross capital value of the differential frequently exceeds the Paasche estimate. On inspection, however, this result is quite explicible. Recall that the Lespeyre estimate is obtained by evaluating the earnings function of physicians at observed hours in the alternative occupation. Because the marginal wage rate of physicians is low, both absolutely and relative to that of most comparison occupations, this implies only a slight reduction in physician earnings. Given a higher marginal wage rate (or if lower, a marginal wage rate which is declining less rapidly), evaluating the earnings function of the alternative occupation at estimated physician hours implies a significiant increase in alternative earnings in the Paasche estimate, resulting in a significant reduction in the estimated earnings differential. Also, because the excess of physician over nonphysician hours declines over the lifecycle, the effect of the hours adjustment in the Paasche estimate will be greater in the early years of labor force activity, which will be disproportionately reflected in the present values.

The effect of the mortality adjustment can be assessed by comparing, first, Tables 7.1 (no mortality adjustment) and 7 .2 (population mortality adjustment). Because of delayed physician entry into the labor force and the generally more rapid growth of physician earnings with experience, physician earnings are disproportionately concentrated in the high mortality phase of the lifecycle (e.g., after age 55 when the age-specific mortality rate first exceeds one percent). Thus, the incorporation of the population mortality adjustment reduces the gross capital values of physician training and occupational choice by between five and twenty percent, depending on comparison occupation and measure.

Introducing occupation-specific mortality has only minor consequences for estimated returns to physician training, as can be seen by comparing Table 7.2 to Table 7.3 Because the standard mortality ratio of physicians (although less than that of the population at large) exceeds that of most other professional occupations, the gross capital values usually decline marginally. Only by comparison to health technicians (SMR=109), trade-related managers (SMR=98) and accountants (SMR=94), would estimated returns rise.

Increasing the discount rate from five to ten percent has much more drastic consequences for returns to physician training (comparing Tables 7.3 and 7.4, each of which incorporates occupation-specific mortality). Again, however, the unadjusted and nonlinear hours-adjusted measures correspond resonably closely in most cases. The contrast between the nonlinear hours adjustment and the inappropriate linear hours adjustment is even more obvious at the higher discount rate. Utilizing the linear adjustment, returns to physician training would be unambiguously negative in two cases (lawyers and computer and mathematical specialists) and would be ambiguously negative (with the linear Paasche estimate negative and linear Lespeyre estimate positive) in seven cases (miscellaneous managers, trade-related managers, engineers, bank officers, public administrators, accountants, and engineering and science technicians). In contrast, the nonlinear hours adjustment would imply unambiguously positive returns by comparison to all occupations other than law, for which returns would be ambiguous (negative Paasche and positive Lespeyre).

However, focusing on the appropriate nonlinear hours adjustments, even with a ten percent discount rate gross physician capital values would unambiguously exceed $50,000 in three cases (natural scientist, college faculty,

and other teachers), and would fall short of $20,000 unambiguously in only two cases (lawyers and computer and mathematical specialists) and ambiguously in four cases (engineers, trade-related managers, miscellaneous managers, and bank officers).

On a variety of grounds the ten percent discount rate seems excessive. Consider that real interest rates (nominal rates less the rate of inflation) historically have been less than three percent, usually less than 1.5 percent, and frequently even less than one percent. Thus, even if the earnings profiles in real terms were not shifting upward secularly at all, the five percent discount rate employed in Tables 7.1 through 7.3 would be about twice the real rate of return available in alternative assets. For this reason, the five percent discount rate estimates can be argued to be more realistic than the ten percent discount rate alternatives.

Accepting the estimates based on the five percent discount rate, then, the gross returns to medical training are quite high by comparison to any of the alternative occupations considered here, with the possible exception of law. These gross capital value estimates, however, are unadjusted for differential schooling costs, which must be incorporated if net returns to a medical career are to be derived.

Because the unadjusted (V^U) and Paasche and Lespeyre linear adjusted (V^{ALP} and V^{ALL}) estimates of gross capital values are clearly inappropriate, these can be dispensed within the derivation of the net capital values. To further simplify the analysis a geometric mean hours adjusted estimate is utilized here as a single replacement for the Paasche and Lespeyre nonlinear hours adjusted estimate (V^{ANP} and V^{ANL}). This geometric (superscript G)

nonlinear hours adjusted estimate is defined as

$$V_{ij}^{ANG} = \sum_{a=L}^{U} \left(S_{iLa} \, \overline{Y}_{Nia(\overline{H}ga)} - S_{jLa} \, \overline{Y}_{Nja(\overline{H}ga)}\right) (1 + r)^{-(a - L)}$$

where $\overline{H}_{ga} = (\overline{H}_{ia} \cdot \overline{H}_{ja})^{1/2}$ is the geometric mean of hours in occupations i and j at age a.

This nonlinear geometric mean hours adjusted measure will generally lie between the nonlinear Paasche and Lespeyre measures.[3]

The nonlinear geometric mean hours adjusted measures of the gross capital values of returns to a medical career are presented in Table 7.5, which also indicates modal years of schooling in each of the alternative occupations (the level of schooling assumed in the evaluation of the earnings functions). If schooling costs were identical for all individuals, independent of occupation and year of schooling, then it would be necessary only to reduce these gross returns by the present value (at age 18) of the costs of differential years of schooling (medicine versus the alternative occupation). In fact, of course, schooling costs vary significantly across types of institutions (e.g., public versus private, two-year college versus four-year college versus university) and levels of schooling (e.g., graduate versus undergraduate), as indicated in Table 7.6.

To limit the number of possible estimates of differential physician schooling costs, lower-bound estimates of schooling costs in each alternative occupation are utilized, while for medicine lower and upper bounds are estimated. For occupations for which modal schooling is 14 years, the two post-high-school years are assumed to be taken in two-year public institutions. Occupations exhibiting a mode of 16 years of schooling are assumed to involve four post-high-school years in a public four-year institution. For modes greater than 16, additional years of schooling are assumed to be taken in

public universities at mean graduate tuition costs. Finally, for medicine a lower-bound estimate is based on the assumption of four undergraduate years at a public four-year institution and four years of medical school at a public university, while an upper-bound for actual costs assumes both undergraduate and medical schooling at a private university. A third, radically higher estimate is obtained by using the Institute of Medicine's (IOM) estimate of "net educational costs per student" of medical schools as a proxy for "full cost" medical school tuition. The IOM 1972-73 net cost estimate of $9,900 at private medical schools, inflated at eight percent per year to 1975-76, gives a full cost tuition estimate of about $12,400; when medical school full cost tuition is assumed, it is also assumed that the medical student attended a four-year public college.

Since an overestimate of foregone earnings has already been taken into account with the estimation of the present value at age 18 of lifetime earnings on the assumption of zero earnings while in school, the only schooling costs which should enter the calculations are tuition, required fees and other necessary out-of-pocket schooling expenses (e.g., books, laboratory fees and supplies, etc.), explicitly not including room, board and other personal consumption expenses. Also, on the assumption that schooling costs are increasing over time at the rate at which the earnings profiles are shifting secularly, it is necessary to state these expenses in 1976 dollars. On the conservatively high assumption of a ten percent increase in tuition between 1974-75 and 1975-76, incorporating annual miscellaneous educational expenses of $100 at two-year institutions, of $200 at four-year public institutions for undergraduates, of $300 at private universities for undergraduates, of $400 for non-medical graduates students and of $600 for medical students, and rounding to the

nearest $100, following cost estimates per year of schooling are obtained:

	Schooling Expenses
Undergraduate	
Two-year public	$ 500
Four-year public	700
Four-year private	3,100
Graduate	
Non-medical	1,200
Medical public	1,700
Medical private	3,800
Medical "full cost" tuition	13,000

The present values at age 18 (discounting at five percent) of the assumed schooling phases are

(1)	Two undergraduate years at a public two-year institution	$ 930
(2)	Four undergraduate years at public four-year institution	2,480
(3)	Four undergraduate years at private four-year institution	10,370
(4)	Three non-medical graduate years at public university	2,690
(5)	Four non-medical graduate years at public university	3,500
(6)	Four years of medical school at public institution	4,960
(7)	Four years of medical school at private institution	11,080
(8)	Four years of medical school at "full cost" tuition	3,7920

Total post-high-school costs of schooling, by occupation, are then

Occupations with 14 years of schooling {(1) above}	$ 930
Occupations with 16 years of schooling {(2) above}	2,480
Occupations with 19 years of schooling {(2) + (4)}	5,170
Occupations with 20 years of schooling {(2) + (5)}	5,980
Medicine lower bound {(2) + (6)}	7,440
Medicine upper bound {(3) + (7)}	21,450
Medicine "full cost" tuition {(2) + (8)}	40,400

Net capital values of the choice of medicine over alternative occupations are indicated in Table 7.5. Using the lower-bound estimate of medical schooling costs, the net returns to medicine are in excess of $100,000 by comparison to all alternatives other than law and computer and mathematical specialties, for which net values of $26,000 and $76,000, respectively, are observed. Even with the upper bound estimate of actual 1976 costs the returns to medicine are unambiguously positive, although returns relative to law fall to less than

$12,000. More remarkable still, even with "full cost" medical school tuition, net returns would exceed $70,000 in all occupations other than law and computer-mathematical specialties, and would be negative ($-7,200) only by comparison to law.

The importance of recognizing the nonlinearity of the hours-earnings relationship is indicated by Table 7.7, which replicates Table 7.5 but inappropriately assumes linearity of the hours-earnings relationship. The measure of gross capital values here is a linear geometric mean-hours adjusted estimate, defined as

$$V_{ij}^{ALG} = \sum_{a=L}^{U} \Big(S_{iLa} \, \bar{Y}_{Nia} \, \frac{(\bar{H}_{ia} \cdot \bar{H}_{ja})^{1/2}}{\bar{H}_{ia}} \Big) - S_{jLa} \, \bar{Y}_{Nja} \, \frac{(\bar{H}_{ia} \cdot \bar{H}_{ja})^{1/2}}{\bar{H}_{ja}} \Big) (1 + r)^{-(a - L)}$$

which again will generally lie between the linear Paasche and Lespeyre estimates.

Even on the lower bound medical school cost assumptions, the cost assumption of hours-earnings linearity results in net return estimates of less than $100,000 in ten of the fourteen comparisons and of less than $50,000 in three comparisons. At the upper bound estimate of actual medical school costs net returns would be less than $50,000 in six cases and negative in two. Finally, with full-cost medical school tuition net returns would fall below $50,000 in comparison to eight alternative occupations while net capital losses of more than $25,000 would be indicated by comparison to law and computer-mathematical specialties.

Returning to the more appropriate nonlinear hours adjusted estimates of net capital values of choice of a medical career, as presented in Table 7.5, returns to medicine are unambiguously positive by comparison to all occupations at prevailing schooling costs, especially when it is considered that schooling costs for alternative occupations represent lower-bound estimates. Even if a move should be made toward an approximately "full-cost" tuition policy, medicine (with a continuation of subsidies to all other schooling) would be highly profitable by comparison to all occupations other than law, and even

by comparison to law it would represent a virtual "break even" option. Only if returns are incorrectly adjusted for hours of work differentials can it be argued that the economic returns to medicine would be seriously eroded as a result of radical reductions in subsidies to medical schooling.

8. SPECIALTY-SPECIFIC PHYSICIAN NET EARNINGS FUNCTION

Due to the limitations of the CPS data, it was impossible in the predeeding analysis to control for physician specialty in the estimation of the earnings functions and of the returns to physician training. Thus, the CPS analysis refers to physicians undifferentiated by specialty. In this and the following section, the Health Care Financing Administration's (HCFA) Physician Practice Cost and Income Survey 1976 is utilized to estimate specialty-specific net earnings functions and returns to specialization.

The 1976 PPCI survey of office-based physicians covered physicians in seventeen primary specialties. Because of sample size constraints, these were collapsed into ten basic specialty groups. These groups are described in Table 8.1, which also presents approximate median earnings (obtained by evaluating the mean of the natural logarithm of net earnings from practice), the dispersion of earnings (evaluating the mean of the log of earnings plus and minus one standard deviation), and the mean and standard deviation of annual medical practice hours. Sample sizes range from 190 (allergy and dermatology) to 317 (psychiatry).

Mean earnings of the HCFA sample, $54,893 over all specialties, significantly exceeds that of the CPS physician sample ($34,746). This difference may reflect a number of factors, e.g., different specialty distributions and the systematic exclusion of salaried and non-office-based physicians in the HCFA sample. The most important difference between the two samples in this regard is the

discrepancy in mean ages, 49.0 for the HCFA sample versus 44.4 for the CPS sample. This difference undoubtedly reflects primarily the exclusion of physicians in training in the HCFA samples (who are both non-office-based and salaried), a group included (but individually unidentifiable) in the CPS.

Approximate median earnings vary substantially across specialties, from $45,356 in psychiatry to $69,838 in neurological and orthopedic surgery. However, the variation in median earnings across medical specialties is substantially less than that observed across the diverse CPS occupation (from $10,168 for health technicians to $34,746 for physicians). More importantly, as would be expected the dispersion of earnings within individual specialties is substantially less than that observed for the CPS physicians, as the following dispersion indices (upper divided by lower bound of the evaluated log mean plus and minus one standard deviation) and log standard deviations indicate:

	INDEX	Log Stan. Dev.
Pediatrics	2.2	.39
General Surgery	2.4	.43
Internal Medicine	2.5	.46
Psychiatry	2.5	.46
Ob/Gyn	2.5	.47
General/Family Practice	2.5	.47
Neurological and Ortho Surgery	2.6	.47
Cardiovac/Gastro/Urol	2.6	.48
Allergy/Dermatology	2.7	.49
Opthamology/Otolaryngology	2.8	.51
All CPS Physicians	3.0	.54

Although the basic form of the net earnings function (equation 6.1) estimated for the HCFA sample is identical to that used in the CPS analysis, because of extreme collinearity it was impossible to include in the estimated specialty-specific net earnings functions either (a) both annual hours and the natural logarithm of annual hours or (b) any of the hours-experience interaction terms included in the CPS analysis. Thus, the natural logarithm of net practice

earnings is expressed as a linear function of the natural logarithm of annual hours, implying a constant (but not necessarily unitary) elasticity of earnings with respect to hours.

The explanatory variables, included in all specialty net earnings functions, are

Annual hours (ln)
Experience (Age minus age at receipt of MD, in decades)
Experience squared
Weeks worked (ln)
Age at receipt of MD
Dummy variable for solo practice
Dummy variable for incorporated
Dummy variable for greater than average hours in survey week
Dummy variable for less than average hours in survey week
Dummy for board certified

Although experience is still a proxy variable, in that actual years of medical practice experience are not known, this proxy is clearly superior to that employed in the CPS analysis. In the latter it was implicitly assumed that the individual entered school at age six and continued through without pause to the completion of the highest year of schooling reported (assumed in the case of medicine to be twenty years, since the CPS reports only nineteen or more years of schooling as an open-ended maximum category). Here the actual date (year) of medical school graduation is known, and experience is defined as years subsequent to medical school graduation.

Age at medical school graduation is included to permit later graduation to shift the earnings function, on the hypothesis that later graduation (possibly reflecting greater difficulty in obtaining entry to medical school and completing degree requirements) will be reflected in lower earnings, ceteris paribus. The dishotomous solo and incorporated practice variables are intended to capture both the real effects of alternative modes of practice organization on demand, productivity and earnings, and also the consequences

of legal structure for reported earnings. Board certification is expected to have a positive effect on earnings, ceteris paribus, through its effects on demand and on the nature or practice activity.

Annual hours are obtained by multiplying medical practice hours reported for the survey week by annual weeks reportedly devoted to practice. This approach, therefore, will magnify any discrepancy in hours between the survey week and a truly average week. For this reason, dummy variables (the greater or less than average hours variables) were included to reflect the stated relationship between the survey week and the average week.

The estimated net earnings functions are presented in Table 8.2. With the exception of neurological and orthopedic surgery, experience is found to have substantial and in general statistically highly significant effects, first increasing and then reducing earnings. The failure of the experience variables to exhibit the expected signs in the case of neurological and orthopedic surgery may reflect the pronounced effects of obsolesence of skills and of the deterioration of physical capabilities with age in these specialties.

Conforming to the findings for the CPS physicians, the elasticity of earnings with respect to hours is remarkably low. In the cardiovascular/gastroenterology/urology specialty, a negative (but not statistically significant) elasticity is estimated. With the exception of psychiatry and opthamology/otolaryngology, for which positive elasticities of 0.6 and 0.5 are estimated these elasticities never exceed 0.33 (ob/gyn) and fall as low as 0.1 (general surgery).

Holding annual hours constant, a statistically significant relationship between annual weeks of practice and earnings is found for neurological/

orthopedic surgery and obstetrics/gynecology (negative) and for cardiovascular/gastroenterology/urology (positive), suggesting in the former economies of concentrating activity over shorter spans of time and the reverse in the latter.

The coefficient of the solo practice dummy variable is invariably negative and usually statistically significant, reducing earnings by in excess of ten percent and by as much as one-third in all specialties other than allergy/dermatology and opthamology/otolaryngology. Conversely, an incorporated practice is associated with increases in net earnings of between four and twenty-four percent, notwithstanding the fact that net earnings would be expected to be understated by incorporated practitioners (e.g., as a result of reporting only salary and not corporate retained earnings).

Age at receipt of the MD, contrary to expectations, is statistically significant (negatively) only for opthamology/otolaryngology. Also, board certification is significantly positive only for obstetrics/gynecology, pediatrics, allergy/dermatology and neurological/orthopedic surgery.

Surprisingly, reporting greater than average hours in the survey week is negatively significant only for obstetrics/gynecology, while reported less than average hours is never significantly positive.

Although a functional form implying a constant elasticity of earnings with respect to hours has been estimated, because the estimated elasticity is less than unity the marginal wage rate will decline and will be less than the average wage rate. This is indicated in Table 8.3 which presents the estimated marginal wage rate at five hypothetical levels of annual hours and at ages 30 to 75, assuming a three year period of graduate medical training. Since the PPCI explicitly excludes trainees, the estimates cannot

be extrapolated back to the date of degree receipt, as was done in the case of the CPS estimates. These estimates also assume an unincorporated group practice and medical school graduation at age 26.

Marginal wage rates decline markedly with increases in hours, falling in most specialties by more than one-third when annual hours increase from 1600 to 3000. With the exception of neurological and orthopedic surgery, for which a continuous decline is observed, marginal wage rates first rise and then decline with age.

Table 8.4 parallels the preceeding table, identifying earnings as a function of annual hours and age. Because of the low and declining marginal wage rate, earnings increase very little with increases in hours, For example, even in psychiatry, with the highest elasticity of earnings with respect to hours, a 20 percent increase in hours (from 2000 to 2400) results in only a 12 percent increase in earnings.

As in the case of the CPS occupations, it is possible to decompose predicted earnings over the lifecycle into components attributable to changes in (a) marginal wage rates and (b) annual hours. This decomposition is summarized, by specialty, in Table 8.5. With the exception of neurological and orthopedic surgery, for which earnings decline continuously with age and experience, earnings peak between the ages of 44 and 52.

Marginal wage rates rise in all cases from age 30 to age of peak earnings, on average by about 25 percent. However, because hours decline over the same period (except in general surgery), the relative increase in earnings is less than the proportionate increase in the marginal wage rate. From the age of peak earnings to age 65 the marginal wage rate declines in all specialties other than general surgery. Annual hours deline in all specialties over this

period. Thus, earnings at age 65 are substantially less than peak earnings. If hours were constant (e.g., in Table 6.5 at 2400), earnings would generally peak slightly later, would rise more from age 30 to age of peak earnings and would decline less from the peak to age 65.

9. ESTIMATES OF RETURNS TO PHYSICIAN SPECIALIZATION

Given the specialty-specific earnings functions it is possible to estimate the returns to specialization. In addition to the unadjusted and alternative linear and nonlinear, Paasche and Lespeyre adjusted measures presented for gross capital values of returns to physician training in the CPS analysis, this comparison also utilizes the alternative utility-compensated estimates developed in Section 3 above.

For these estimates it is necessary to determine mutually consistent pairs of the utility function parameters γ_0 (the disutility of the first hour of annual work) and γ_1 (the elasticity of the disutility of work with respect to hours worked). Three such pairs, consistent with utility maximization subject to the estimated earnings function at the observed hours of work, are computed for each speciality and age under each of two alternative assumptions concerning the change in the utility function with age:

(1) that age has only a fatigue effect, altering γ_1 while holding γ_0 constant; and

(2) that age serves to alter the disutility of work equiproportionately, altering γ_0 while holding γ_1 constant.

On the equiproportionate shift assumption, three values of γ_0 (denoted G0(1), G0(2), G0(3)) are determined for age invariant values of γ_1 of 1.5, 2.25 and 3. Holding γ_0 constant, three values of γ_1 (denoted G1(1), G1(2), G1(3)) are determined for age-invariant of γ_0 of 0.01, .0001, and .000001.

These estimated utility function parameters, by specialty and age, are presented in Table 9.1 With the exception of neurological and orthopedic surgery, these parameters initially increase with age, i.e., the disutility of any given number of annual hours rises. However, with the exception of general surgery this rate is invariably followed by a decline, generally at around age 50. The most notable observation is the rapidly rising marginal disutility of work revealed for psychiatry.

Tables 9.2-1 through 9.2-10 indicate by year since medical school graduation the earnings, marginal wage rates and hour which an incumbent in any specialty i experiences in specialty i and would experience were he in general practice (specialty j). The earnings measures (first row at each year since medical school graduation) are

Column 1 $\overline{Y}_{Nja(\overline{H}ja)}$

Column 2 $\overline{Y}_{Nja(\overline{H}ia)}$

Column 3 $\overline{Y}_{Nia(\overline{H}ja)}$

Column 4 $\overline{Y}_{Nja} \frac{\overline{H}ia}{\overline{H}ja}$

Column 5 $\overline{Y}_{Nia} \frac{\overline{H}ja}{\overline{H}ia}$

Columns 6-11 $\overset{C}{\overline{Y}}_{Nia(\overline{H}jia)}$ for G0(1), . . .,G0(3), G1(1), . . .,G1(3)

Column 12 $\overline{Y}_{Nia(\overline{H}ia)}$

Columns 13-18 $\overline{Y}_{Njia(\overline{H}jia)}$ for G0(1), . . ., G0(3), G1(1), . . ., G1(3)

Columns 1 through 5 and 12, then, give the incomes necessary to derive the alternative unadjusted and adjusted nonlinear and linear, Paasche and Lespeyre gross capital value measures utilized as estimates of returns to physician

training for the CPS. Columns 6 through 11 give the compensated-utility incomes associated with actual earnings in i and the hours which would be selected if the i incumbent confronted the earnings function for j and maximized a utility function having the parameters estimated for i. Columns 13 through 18 indicate the earnings in comparison specialty j which a utility-maximizing incumbent in i would choose if confronted by the j earnings function.

The second row at each year since medical school graduation indicates the marginal wage rate associated with the corresponding earnings measure. Note that in the case of the fourth and fifth measures (linearly adjusted earnings in j and i) these correspond (are equal) to average earnings in general practice (j) and in the subject specialty.

The final row at each year since medical school graduation presents the hours estimates (actual or derived on the assumption of utility maximization) corresponding to the column's earnings and marginal wage rate:

Column 1	$\overline{H}_{ja}$ (estimated actual hours in general practice)
Columns 2-11	Blank $\left((2) = (12);\ (3) = (1);\ (4) = (12);\ (5) = (1);\ (6), \ldots, (11) = (13), \ldots, (18)\right)$
Column 12	$\overline{H}_{ia}$ (estimated hours in specialty i)
Columns 13-18	$\overline{H}_{jia}$ for G0(1), . . ., G0(3), G1(1), . . ., G1(3)

If $\overline{H}_{jia}$ exceeded 4200, it was arbitrarily reset to 4200, thus preventing incumbents in i to opt for clearly unreasonable levels of annual hours when confronted by the j (general practice) earnings function. In the cases in which this constraint would otherwise be exceeded there is clear evidence that specialty choices and/or hours of work are not being freely determined by the physician.

The two final summary rows at the end of Tables 9.2-1 to 9.2-10 provide present values at medical school graduation (assumed to occur at age 26) of earnings from the initiation of practice through age 71, with entry into practice after completion of a period of graduate (internship/residency) training specified by specialty and with earnings adjusted for specialty-specific mortality.

Stipulated periods of graduate training for each specialty are based upon stated certification requirements of various specialty boards, with consideration for the treatment by each specialty board of the first (internship) year of training. Subspecialty training, however, has not been taken into account. The assumed durations of graduate training, by specialty, are

(1)	General/family practice	2	graduate	training	years
(2)	General surgery	4	"	"	"
(3)	Internal medicine	3	"	"	"
(4)	Obstetrics/gynecology	4	"	"	"
(5)	Pediatrics	3	"	"	"
(6)	Psychiatry	4	"	"	"
(7)	Allergy/dermatology	4	"	"	"
(8)	Neurological/orthopedic surgery	5	"	"	"
(9)	Opthamology/otolaryngology	4	"	"	"

Thus, the indicated first year of practice, assuming medical school graduation at age 26, would occur at age 29 for general/family practice, at age 30 for internal medicine and pediatrics, at age 31 for general surgery, obstetrics and gynecology, psychiatry, allergy and dermatology, and opthamology and otolaryngology, and at age 32 for neurological and orthopedic surgery.

Adjustments for mortality are based on estimated age-specific mortality rates of male physicians, modified by standard mortality ratios for each specialty.[4] The age-specific physician mortality rates (per 1000 persons in the specified age group) utilized here are

Ages 27 to 34	0.7 per 1000
Ages 35 to 39	1.4 per 1000
Ages 40 to 44	2.2 per 1000
Ages 45 to 49	4.3 per 1000
Ages 50 to 54	6.6 per 1000
Ages 55 to 59	11.1 per 1000
Ages 60 to 64	18.7 per 1000
Ages 65 to 69	29.4 per 1000
Ages 70 and 71	46.4 per 1000

standard mortality ratios, by specialty, are

		SMR
(1)	General/family practice	1.143
(2)	General surgery	0.891
(3)	Internal medicine	0.834
(4)	Obstetrics/gynecology	0.853
(5)	Pediatrics	0.725
(6)	Psychiatry	0.960
(7)	Allergy/dermatology	0.890
(8)	Neurological/orthopedic surgery	0.807
(9)	Opthamology/otolaryngology	0.799

Apart from the observation that higher than average mortality of general practitioners (greater by 14 percent than that of all physicians) is offset by lower than average mortality of the specialties considered here (generally

10 to 20 percent less than average), these specialty-specific differences require little comment, although the remarkably lower than average mortality experience of pediatricians might be noted. Also, the variation in mortality across medical specialties is substantially lower than that observed across the professional occupations identified in the CPS analysis.

As in the case of the CPS analysis, in the absence of evidence concerning the causal relationship between specialty and mortality it is not clear that specialty-specific mortality experience should be considered in estimating returns to specialty choice. If these differences reflect ex ante, specialty-independent differences in mortality experience, due, e.g., to processes of selection or self-selection in specialties, then the mortality expectations of the marginal entrant into a specialty may differ significantly from those of the representative incumbent. Thus, it is again appropriate to develop alternative estimates of returns to specialty choice, differing with respect to the assumption made concerning the relationship of specialty to mortality.

Estimates of the gross capital values of lifetime earnings differentials, comparing each specialty to general practice, are presented in Tables 9.3, 9.4 and 9.5, utilizing discount rates of five and ten percent. Table 9.3 makes no adjustment for mortality, while Tables 9.4 and 9.5 incorporate physician and specialty mortality, respectively. The columns of these tables present

V^{U} : unadjusted for hours
V^{ANP} : adjusted nonlinear Paasche
V^{ANL} : adjusted nonlinear Lespeyre
V^{ALP} : adjusted linear Paasche
V^{ALL} : adjusted linear Lespeyre

$V^{G0(1)}$: compensated hours of work utility adjusted (G0(1))
$V^{G0(2)}$: compensated hours of work utility adjusted (G0(2))
$V^{G0(3)}$: compensated hours of work utility adjusted (G0(3))
$V^{G1(1)}$: compensated hours of work utility adjusted (G1(1))
$V^{G1(2)}$: compensated hours of work utility adjusted (G1(2))
$V^{G1(3)}$: compensated hours of work utility adjusted (G1(3))

Row pairs correspond to the various specialties relative to the alternative of general practice. The first row of each pair assumes a five percent discount rate, the second a ten percent discount rate. An asterisk indicates that the 4200 hour constraint in a compensated utility estimate was exceeded in at least one year.

With the exception pediatrics, for which the effect of experience on earnings is quite attenuated, the Paasche and Lespeyre, nonlinear and linear gross capital value estimates decline when physician mortality is introduced (comparing Table 9.4 to Table 9.3 . However, recognition of specialty-specific mortality (Table 9.5) increases these estimates in all cases, and with the exception of internal medicine, gross returns to specialization are higher when specialty-specific mortality is incorporated than when mortality is ignored. This finding reflects the significantly higher relative mortality experience of general practitioners. Because the alternative mortality adjustments lead to very similar conclusions, discussion hereafter is limited to the gross capital value estimates of returns to specialty choice on the last assumption of specialty-specific mortality, with primary emphasis on the results employing a five percent discount rate.

On an hours-unadjusted basis gross returns are positive and substantial only for four specialties (general surgery, internal medicine, obstetrics and

gynecology, and neurological and orthopedic surgery); ophthalmology and otolaryngology represent a (gross) break-even proposition, while losses of in excess of $70,000 are estimated for pediatrics, psychiatry, and allergy and dermatology.

Contrary to the findings of the CPS analysis, in which introduction of an hours adjustment reduced the gross capital values of returns to physician training, the hours adjusted estimates of returns to physician specialization are in all cases higher, often substantially higher, than the hours-unadjusted estimates. Focusing on those estimates appropriately recognizing the nonlinearity of the hours-earnings relationship, the Paasche and Lespeyre estimates (V^{ANP} and V^{ANL}) of the returns to ophthalmology/otolaryngology are $49,000 and $88,000, respectively, compared to an unadjusted estimate (V^{U}) of $12,000, while for psychiatry the Paasche and Lespeyre estimates of $-53,000 and $-4,000 compare to an unadjusted estimate of $-89,000. Even with the nonlinear hours adjustments, however, losses are still indicated for pediatrics, psychiatry and allergy/dermatology.

The comparison of the nonlinear and linear hours-adjusted measures again results in findings quite different from those observed in the CPS estimation of returns to physician training. In the latter case, the linear hours-adjusted measures resulted in severely downward biased estimates of returns to physician training. In contrast, the inappropriate linear adjustments would greatly overstate the returns to physician training. Thus, while the two nonlinear adjusted estimates of returns to specialization in allergy/dermatology indicated losses of about $26,000, the linear adjusted estimates would indicate positive returns of between $106,000 and $133,000. Similarly, while the nonlinear estimates unambiguously indicate losses to psychiatry

(of \$-71,000 and \$-75,000), the linear estimates would incorrectly suggest unambiguously positive returns in excess of \$50.000. Only pediatrics would still appear as a negative return specialty if inappropriate linear hours adjustments were utilized.

The utility-function-dependent estimates of returns are in general not highly sensitive to the assumed degree of convexity of indifference curves in the hours earnings space or to the alternative assumptions concerning life-cycle changes in the disutility of work. The only significant exception to this generalization is psychiatry, for which losses decline significantly as the degree of convexity (rate of increase of the marginal disutility of work) is increased, e.g., from \$-108 for G0(1) to \$-78,000 for G0(3). The same effect is observed to a lesser extent for ophthalmology/otolaryngology, for which returns rise from \$7,000 to \$30.000 with an increase in γ_0 from G0(1) to G0(3).

In only two cases, allergy/dermatology and neurological/orthopedic surgery, do the returns indicated by the utility-adjusted measures exceed those of the both the Paasche and Lespeyre nonlinear hours-adjusted measures. In all cases the utility-adjusted measures of returns are substantially less than the inappropriate linear adjusted Paasche and Lespeyre estimates. Thus, with the two exceptions just noted, it is reasonable to conclude that the nonlinear hours-adjusted measures represent upper bounds on the "true" returns to specialization, and that the linear hours-adjusted measures are extremely upward biased. But even in the case of the two exceptions the qualitative conclusion, that losses would be incurred in the choice of allergy/dermatology while substantial economic profits accrue to neurological/orthopedic surgery, would not be altered by a shift from the utility-

adjusted to the Paasche and Lespeyre nonlinear hours-adjusted estimates. The finding of marked upward bias in the linear measures is unqualified.

The utility-adjusted measures would unambiguously fall below both the unadjusted and nonlinear adjusted measures only in the case of general surgery. In all other cases, these measures would lie between the unadjusted and nonlinear adjusted estimates. In general, then, the unadjusted and nonlinear adjusted estimates place reasonable bounds on actual gross returns to specialization.

Because undergraduate medical education, i.e., receipt of the MD, is required for entry into all specialties, it is not necessary to adjust these estimates of the gross capital values of returns to specialization for schooling costs. If the duration of graduate training (post-MD internship and residency) was identical in all specialties, and if resident stipends were invariant across specialties, then these gross estimates would also be net estimates of returns to specialization, and no further adjustments would be required. However, the duration of residency training clearly differs across specialties, and residency stipends historically have varied significantly although the inter-specialty variation has contracted substantially over time, especially over the decade 1965-66 to 1975-76, as indicated in Table 9.6.

If residency is considered an extension of the schooling period (and implicity, if no net utility or disutility is associated with either pre-residency or residency "schooling"), then it is appropriate to consider the residency stipend as a (negative) tuition charge and to adjust the gross capital values of returns in a manner identical to the derivation

of the CPS estimates of net capital values adjusted for schooling costs. Note that the residency stipend can be considered a negative tuition charge because the gross capital value estimates discount earnings to the year of medical school graduation (assumed to occur at age 26), with the stipulation of zero "practice earnings" for the period prior to completion of the residency and entry into active practice.

Stipends reported in Table 9.6 apply only to first year residents. Thus, it is necessary to make some adjustment for increases in stipends with increased experience. Because of informal evidence of significant increments in stipends with experience, it is assumed here that stipends cross-sectionally are increased by ten percent for each additional year of experience. Thus, the present value at medical school graduation of stipends over the specialty i residency period is

$$V^{Si} = \sum_{a=1}^{L'} S_{i1} (1 + g)^{a-1} (1 + r)^{-a}$$

$$\approx \sum_{a=1}^{L'} S_{i1} (1 + g)^{-1} (1 + r - g)^{-a}$$

where g is the rate of increase in the stipend with increases in experience.

These estimates of the present values of residency stipends in 1975-76 are indicated in the first column of Table 9.7, assuming $g=0.1$ and $r=0.5$. The second column then provides the excess of the present values of residency stipends in specialty i over the stipend present value for general practice.

To limit the number of alternative net capital value estimates, only one utility-adjusted measure of gross capital values of returns to specialization is employed, $V^{G0(2)}$. Also, because the nonlinear Paasche and Lespeyre hours-adjusted measures are quite close, these are replaced by a single nonlinear hours adjustment based on the geometric mean of hours in the subject specialty and general practice, denoted V^{ANG}. Finally, although the linear hours-adjusted measures have been demonstrated to contain a serious upward bias, for comparison purposes a linear geometric mean hours adjusted measure, V^{ALG}, is utilized in the computation of a third alternative measure of net returns.

These three gross capital value estimates of returns to physician specialization, and the corresponding net capital value estimates, are indicated in Table 9.7. In general, the net capital value estimates confirm the conclusions reached on the basis of the gross capital values. Only in the case of allergy/dermatology is a small gross loss converted into a net gain when attention is restricted to the estimates correctly recognizing hours-earnings nonlinearity. Neurological and orthopedic surgery is clearly in a class by itself with a net capital value of in excess of $160,000. Internal medicine and obstetrics and gynecology, with net capital values of returns to specialization in excess of $120,000 and $140,000, are also quite profitable. General surgery and ophthalmology and otolaryngology constitute a third class, with net capital values of returns in excess of $50,000. Finally, allergy and dermatology represents a break-even specialty, while psychiatry may entail a small net loss (of less than $50,000 and possibly break-even) and pediatrics implies a substantial loss (of greater than $50,000).

Again, the importance of recognizing hours-earnings nonlinearity is revealed. However, while the assumption of linearity would have let to downward biased estimates of net returns to physician training, it would greatly overstate returns to physician specialization.

10. CONCLUSION

By comparison to alternative occupations physician training has been found to be an extremely profitable investment when the nonlinearity of the hours-earnings relationship in professional occupations is recognized. In addition to compensating the physician for his differential work effort and covering normal interest on his investment (foregone earnings plus tuition, fees and other out-of-pocket schooling expenses) his lifetime earnings are found to contain a substantial element of pure economic profit (e.g., monopoly rent), as demonstrated in Table 7.5.

To summarize that conclusion and to indicate in more intuitively comprehensible terms the magnitudes of these profits (heretofore expressed as present values at age 18), it is useful to consider the lifetime annuities which these economic profits could purchase. Assume that the physician earns in each year what an incumbent in the alternative occupation would earn and incurs only those schooling costs observed in the comparison occupation. The net present value of the differentially higher earnings which the physician would otherwise receive (evaluated at age 18) is used to purchase an annuity which will pay the physician (or his survivors) an equal amount in each of 47 years

(from age 18 to age 65). This amount is specified, however, in 1976 "income dollars" and would increase in each year at the rate at which the cross-sectional earnings-experience functions shifted upward. Note that these annuities and also the earnings which the physician would have received in any alternative occupation, are paid in each year after age 18, even when the physician is in school.

These annual annuities corresponding to net capital values of returns to physician training relative to alternative occupations, under the alternative medical schooling cost assumptions (lower bound actual, upper bound actual, and medical school "full cost" tuition), are indicated in Table 10.1. With the exception of law, the choice of medicine over alternative occupations is equivalent to purchasing an annuity which will pay the 18 year old over $4,000 in every year until age 65, and in many cases the annual payment would exceed $10,000. Even at "full cost" medical school tuition, and assuming a continuation of current subsidies to all other forms of schooling, the annuity would pay over $4,000 per year by comparison to all but two alternative occupations. This indicates quite graphically the extreme profitability of a medical career.

Comparable estimates of annuity equivalents are presented in Table 10.2 for the net capital values of returns to physician specialization, compared to general practice. In this case the annuities are assumed to be paid in each year for the first 45 years after medical school graduation (e.g., from age 27 to age 71 for persons graduating from medical school at age 26). In addition to the annuity the specialist is paid in

each year the amount which he would have received had he entered general practice instead.

Apart from pediatrics, which implies a large negative annual annuity payment (in excess of $-3,000) and psychiatry and allergy/dermatology for which trivial annuities are implied, the differential earnings of medical specialists give rise to economic profits with substantial annuity values, ranging from $4,500 per year for each of 45 years after medical school graduation for general surgeons to $9,300 for neurological and orthopedic surgeons.

Combined with the observation of relative inelasticity of earnings with respect to hours, suggesting at least the possibility of a relatively inelastic demand for the physician's or specialists's services, the finding of high economic profits indicates the probable existence of substantial monopoly power in the medical sector. This conclusion is only reinforced by the estimates of net internal "income" rates of return also presented in Tables 10.1 and 10.2. While the amount which the individual physician can invest in the asset of a medical degree is limited (given prohibitions against involuntary servitude, one can purchase title only to one physician's income stream, one's own), the returns to that investment are exceptionally high relative to the returns on alternative investments.

FOOTNOTES

1. At this stage no adjustment is made for predicted mortality over the lifecycle in the computation of the present value of lifetime earnings. This consideration is added in the following section.

2. These standard mortality ratios are taken from: United States Department of Health, Education and Welfare, Public Health Service, National Vital Statistics Division. Vital Statistics-Special Reports. Mortality by occupation and cause of death among men 20 to 64 years of age: United States, 1950. 53(3): 137-170, Washington, D.C.: Government Printing Office, 1963. The standard mortality ratio for engineers used is a weighted average of the SMR's for all subcategories of engineers. The weighting factor used is $(SMR_i/\text{Actual Deaths})^{-1}$, which is proportional to the population in subcategory i.

   It should be noted that these SMR's are derived from 1950 census data, and therefore, may reflect mortality experiences quite different from that faced by incumbents in these occupations in 1977. Of the occupations considered, this difference is likely to be most substantial in the case of health technicians as a result of the institution of numerous safety precautions subsequent to 1950.

   The age-specific mortality rates for the general population were taken from: United States Department of Commerce, Bureau of the Census. Statistical Abstracts of the United States. 98th Annual Edition, Washington, D.C.: Government Printing Office. (1977)

3. Because of the nonlinearity of the hours-earnings functions and of the hours-age relationships, it is not necessary that the geometric mean hours adjusted estimate lie between the nonlinear Paasche and Lespeyre estimates. However, only in the comparison to natural scientists does the geometric estimate ($214.1) exceed both the Paasche and Lespeyre estimates ($213.4 and $211.6, respectively). Conversely, in five cases the geometric mean estimate is less than both the Paasche and Lespeyre estimates (engineering and science technicians, public administrators, health and education administrators, miscellaneous managers, and computer and mathematical specialists).

4. Louis J. Goodman. Milbank Memorial Fund Quarterly. The Longevity and Mortality of American Physicians, 1969-1973. 53(3): 353-375. Summer 1975.

   Associative comparisons of the mortality-adjusted returns estimated in the two analyses done in this study (CPS professionals to physicians: general practitioners to medical specialists) are valid only if one assumes that the 1950 (Census Bureau) and 1969-73 (Goodman) mortality ratios for physicians are identical. This is approximately correct for the physician population as a whole ($SMR_{1950}=91$, $SMR_{1969-73}=96$). However, for the male physician population the 1969-73 SMR is 74.7, implying that associative comparisons should not be made.

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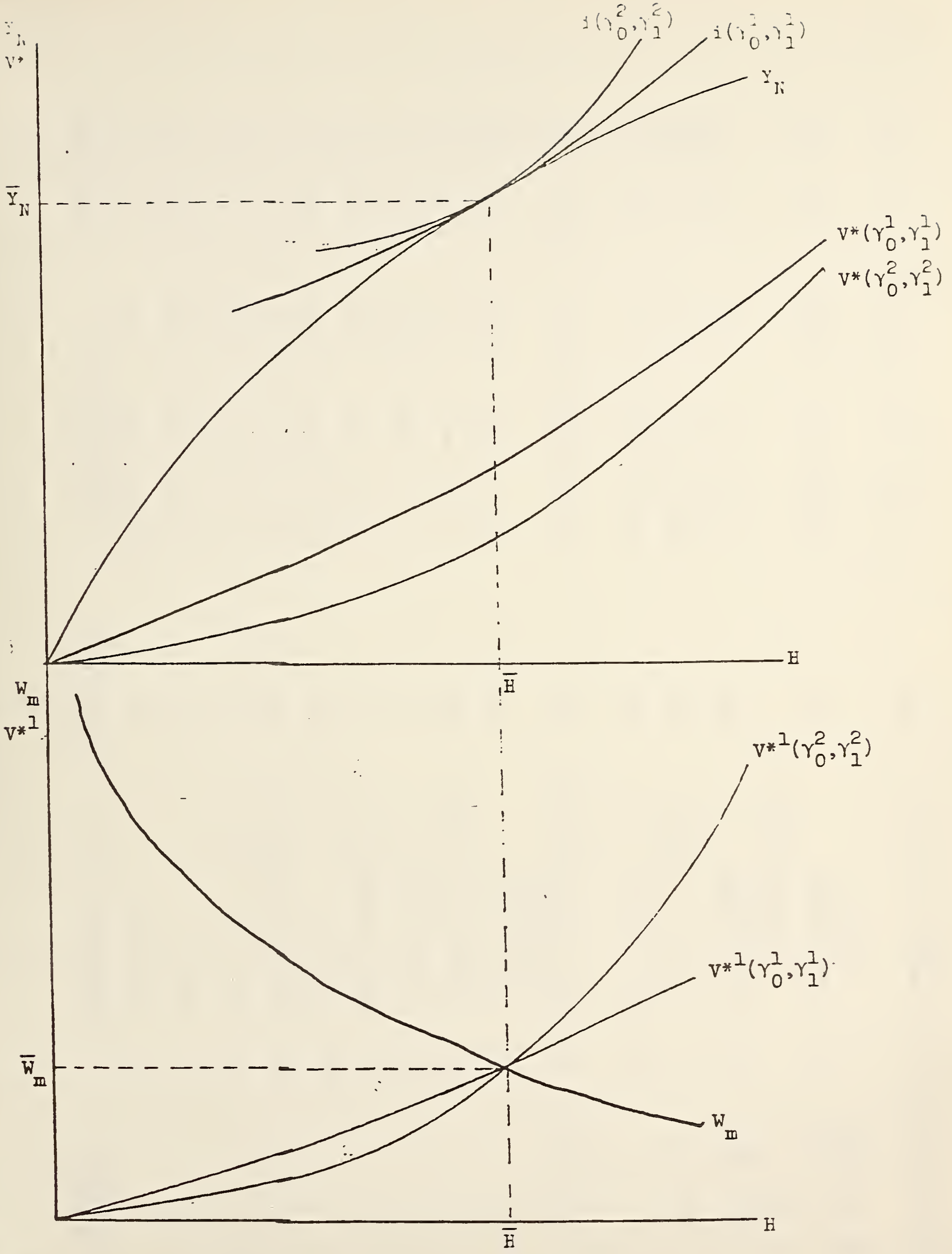

Y_N
V^*
$i(\gamma_0^2,\gamma_1^2)$
$i(\gamma_0^1,\gamma_1^1)$
Y_N
$\bar{Y}_N$
$V^*(\gamma_0^1,\gamma_1^1)$
$V^*(\gamma_0^2,\gamma_1^2)$
H
$\bar{H}$
W_m
V^{*1}
$V^{*1}(\gamma_0^2,\gamma_1^2)$
$V^{*1}(\gamma_0^1,\gamma_1^1)$
$\bar{W}_m$
W_m
H
$\bar{H}$

Figure 3.1

Table 6.1

1970 Census Occ. Codes	Occupation	Number of Observations	Annual Earnings	Annual Hours
001	(1) Accountants	363	$16,469 (9,833 - 27,585)	2,193 (337)
006-023	(2) Engineers	793	20,209 (13,393 - 29,398)	2,231 (378)
030-031	(3) Lawyers and judges	245	21,973 (7,895 - 61,156)	2,439 (543)
042-054	(4) Natural scientists	152	15,370 (7,911 - 29,860)	2,212 (416)
065	(5) Physicians	205	34,746 (20,161 - 59,881)	2,829 (790)
080-085	(6) Health technicians	68	10,168 (6,024 - 17,162)	2,180 (520)
102-140	(7) College faculty	236	16,556 (9,693 - 28,279)	2,381 (678)
141-145	(8) Teachers (ex college)	589	13,387 (9,058 - 19,784)	2,297 (457)
150-162	(9) Eng. & Science technicians	452	13,514 (8,892 - 20,538)	2,149 (302)
201, 213, 215, 222	(10) Public administrators	316	16,066 (9,869 - 26,155)	2,163 (275)
202	(11) Bank officers	270	17,070 (10,708 - 27,212)	2,255 (393)
212, 235, 240	(12) Health & ed. admin.	242	19,776 (13,252 - 29,511)	2,413 (439)
211, 216, 220, 221, 223, 224, 245, 246	(13) Misc. managers and officials (ex trade-related)	3380	14,625 (5,290 - 40,431)	2,494 (578)
203, 205, 210, 225, 230, 231, 233	(14) Trade-related managers	794	13,319 (4,670 - 37,983)	2,457 (582)
003-005,034-036, 055	(15) Computer and math spec.	238	17,310 (11,914 - 25,149)	2,172 (294)

Table 6.2

Estimated 1976 CPS Earnings Equations

Occupation: Variable	(1) Accountants	(2) Engineers	(3) Lawyers & Judges
Annual Hours (ln)	2.945 (0.885)	0.506 (0.079)	8.818 (1.445)
Annual Hours	-1.347 (0.461)		-3.002 (0.510)
Experience	-1.021 (0.352)	0.432 (0.033)	0.073 (0.573)
Experience Squared	0.313 (0.076)	-0.072 (0.007)	0.114 (0.113)
Exp *ln H			0.726 (0.647)
Exp Squared *ln H			-0.292 (0.128)
Exp *H	0.703 (0.159)		
Exp Squared * H	-0.183 (0.034)		
Weeks Worked (ln)	0.821 (0.832)	1.605 (0.378)	0.897 (2.897)
Yrs of Sch	0.000 (0.022)	0.050 (0.013)	
Compl. 16+ Yrs of Sch (0,1)	-0.444 (0.487)	-0.139 (0.242)	
Yrs of Sch, Comp. 16+	0.048 (0.032)	0.011 (0.016)	
Self-Employed (0,1)	0.062 (0.060)		-0.132 (0.118)
SMSA (0,1)	0.137 (0.051)	0.040 (0.025)	0.180 (0.132)
SMSA Cent. City (0,1)	-0.041 (0.053)	-0.044 (0.029	-0.239 (0.139)
R^2	.429	.365	0.332

Estimated 1976 CPS Earnings Equations

Occupation: Variable	(4) N. Scientists	(5) Physicians	(6) Health Technicians
Annual Hours (ln)	0.324 (0.226)	0.877 (0.676)	1.026 (0.248)
Annual Hours		-0.469 0.242	
Experience	0.919 (0.113)	0.199 (0.321)	0.342 (0.177)
Experience Squared	-0.178 (0.029)	-0.030 (0.069)	-0.057 (0.045)
Exp *ln H			
Exp Squared *ln H			
Exp *H		0.250 (0.105)	
Exp Squared * H		-0.058 (0.023)	
Weeks Worked (ln)	6.601 (1.433)	-0.892 (0.993)	1.486 (3.652)
Yrs of Sch	0.097 (0.065)		0.061 (0.045)
Compl. 16+ Yrs of Sch (0,1)	0.708 (1.003)		0.694 (1.444)
Yrs of Sch, Comp. 16+	-0.058 (0.071)		-0.046 (0.090)
Self-Employed (0,1)		0.088 (0.071)	
SMSA (0,1)	0.106 (0.087)	0.091 (0.077)	-0.047 (0.153
SMSA Cent. City (0,1)	-0.159 (0.098)	0.040 (0.078)	-0.017 (0.126)
R^2	0.556	0.370	0.390

Estimated 1976 CPS Earnings Equations

Occupation: Variable	(7) College Faculty	(8) Teachers (ex college)	(9) Eng. & Sci Technician
Annual Hours (ln)	2.022 (0.312)	2.335 (0.384)	4.183 (0.468)
Annual Hours	-0.408 (0.148)	-0.668 (0.163)	-1.446 (0.208)
Experience	1.027 (0.187)	0.961 (0.139)	0.456 (0.044)
Experience Squared	-0.192 (0.052)	-0.213 (0.032)	-0.077 (0.010)
Exp *ln H	-0.681 (0.234)	-0.653 (0.181)	
Exp Squared *ln H	0.141 (.063)	0.164 (0.044)	
Exp *H			
Exp Squared * H			
Weeks Worked (ln)	0.180 (0.481)	-0.227 (0.251)	-0.193 (0.383)
Yrs of Sch	0.080 (0.017)	0.059 (0.007)	0.031 (0.012)
Compl. 16+ Yrs of Sch (0,1)			-0.989 (0.629)
Yrs of Sch, Comp. 16+			0.054 (0.038)
Self-Employed (0,1)			
SMSA (0,1)	0.149 (0.049)	0.128 (0.028)	0.010 (0.032)
SMSA Cent. City (0,1)	0.077 (0.065)	-0.062 (0.036)	-0.065 (0.041)
R^2	0.631	0.432	0.486

Estimated 1976 CPS Earnings Equations

Occupation: Variable	(10) Public Administrators	(11) Bank Officers	(12) Health & Ed Administrat
Annual Hours (ln)	6.26 (1.32)	0.508 (0.814)	3.978 (0.861)
Annual Hours	-2.397 (0.561)	0.079 (0.369)	-1.431 (0.346)
Experience	0.499 (0.068)	1.195 (0.349)	0.460 (0.081)
Experience Squared	-0.080 (0.013)	-0.292 (0.071)	-0.080 (0.019)
Exp *ln H		-0.825 0.433	
Exp Squared *ln H		0.254 (0.088)	
Exp *H			
Exp Squared * H			
Weeks Worked (ln)	-0.278 (0.728)	1.971 (0.998)	-0.002 (0.580)
Yrs of Sch	0.022 (0.017)	-0.004 (0.020)	-0.014 (0.027)
Compl. 16+ Yrs of Sch (0,1)	-0.991 (0.516)	-1.067 (0.474)	-1.091 (0.511)
Yrs of Sch, Comp. 16+	0.075 (0.032)	0.089 (0.031)	0.082 (0.034)
Self-Employed (0,1)			
SMSA (0,1)	0.197 (0.048)	0.185 (0.047)	0.193 (0.046)
SMSA Cent. City (0,1)	-0.014 (0.061)	-0.110 (0.058)	-0.105 (0.064)
$\bar{R}^2$	0.427	0.498	0.374

Estimated 1976 CPS Earnings Equations

Occupation: Variable	(13) Misc. Managers	(14) Trade-related Managers	(15) Computer & M
Annual Hours (ln)	3.56	3.363	4.708
	(0.450)	(0.891)	(1.284)
Annual Hours	-1.023	-1.089	-1.800
	(0.157)	(0.337)	(0.530)
Experience	1.192	0.422	0.373
	(0.175)	(0.089)	(0.073)
Experience Squared	-0.209	-0.069	-0.055
	(0.032)	(0.019)	(0.018)
Exp *ln H	-0.736		
	(0.199)		
Exp Squared *ln H	0.134		
	(0.036)		
Exp *H			
Exp Squared * H			
Weeks Worked (ln)	0.911	0.600	-1.350
	(0.464)	(0.976)	(1.467)
Yrs of Sch	0.064	0.065	0.074
	(0.010)	(0.023)	(0.024)
Compl. 16+ Yrs of Sch (0,1)	0.733	0.916	0.603
	(0.446)	(1.073)	(0.487)
Yrs of Sch, Comp. 16+	-0.040	-0.047	-0.036
	(0.027)	(0.066)	(0.032)
Self-Employed (0,1)	-0.300	-0.618	
	(0.035)	(0.103)	
SMSA (0,1)	0.173	0.209	0.089
	(0.037)	(0.079)	(0.053)
SMSA Cent. City (0,1)	-0.016	-0.105	-0.079
	(0.045)	(0.090)	(0.052)
R^2	0.138	0.170	0.321

Table 6.3

Joint Significance Tests of the Hours, Experience and Schooling Variables

Occupation	Hours*		Experience*		Schooling	
	F(d.f.)	Sig.(%)	F(d.f.)	Sig.(%)	F(d.f.)	Sig.(%
Accountants	11.5(4,349)	<1%	36.8(4,349)	<1%	19.3(3,349)	<1%
Engineers	40.8(1,783)	<1	127.8(2,783)	<1	46.7(3,783)	<1
Lawyers and Judges	16.3(4,234)	<1	12.4(4,234)	<1	N.E.	
Natural Scientists	2.0(1,142)	16	49.6(2,142)	<1	1.7(3,142)	17
Physicians	1.7(4,194)	16	20.7(4,194)	<1	N.E.	
Health Technicians	17.1(1,58)	<1	3.5(2,58)	4	0.9(3,58)	45
College Faculty	22.9(4,225)	<1	26.5(4,225)	<1	22.7(1,225)	<1
Teachers (ex college)	15.7(4,578)	<1	53.1(4,578)	<1	67.8(1,578)	<1
Eng. & Science Technicians	63.6(2,441)	<1	78.6(2,441)	<1	4.5(3,441)	<1
Public Administrators	15.0(2,305)	<1	32.0(2,305)	<1	23.4(3,305)	<1
Bank Officers	9.0(4,257)	<1	31.0(4,257)	<1	32.8(3,257)	<1
Health and Ed. Administrators	15.2(2,231)	<1	27.7(2,231)	<1	10.6(3,231)	<1
Misc. Managers and Officials (ex trade-related)	19.4(4,3366)	<1	44.8(4,3366)	<1	38.4(3,3366)	<1
Trade-related Managers	10.2(2,782)	<1	14.2(2,782)	<1	11.0(3,782)	<1
Computer and Math Spec.	8.2(2,227)	<1	29.0(2,227)	<1	13.1(3,227)	<1

N.E.: Not estimated, variables not included in basic equation.

*: Tested variable set includes hours-experience interactions.

Table 6.4-1

Accountants

OCCUPATION 1 ---- 16 YEARS OF SCHOOLING

Age	Estimated Hours	Predicted Marg Wage and Earn at Est. Hours	Predicted Marg Wage and Earn at Hypothetical Annual Hours				
			1600	2000	2400	2800	3000
25	2108.	3.16	7.07	4.00	1.01	-1.35	-2.22
		12891.	10276.	12504.	13492.	13399.	13039.
30	2199.	7.13	10.29	8.41	5.72	2.90	1.59
		16264.	10941.	14719.	17559.	19279.	19726.
35	2242.	11.28	12.92	12.32	10.40	7.79	6.35
		19738.	11764.	16858.	21447.	25097.	26511.
40	2248.	14.29	14.90	15.02	13.59	11.16	9.73
		22463.	12774.	18820.	24585.	29562.	31654.
45	2225.	14.96	16.01	15.83	14.00	11.15	9.53
		23917.	14008.	20442.	26454.	31507.	33577.
50	2186.	12.90	15.94	14.25	11.05	7.25	5.33
		24142.	15512.	21619.	26714.	30384.	31642.
55	2141.	8.38	14.24	10.07	5.25	0.85	-1.01
		23556.	17347.	22256.	25320.	26512.	26491.
60	2101.	1.89	10.23	3.44	-2.05	-5.53	-6.63
		22576.	19591.	22308.	22523.	20931.	19703.
65	2077.	-6.19	2.96	-5.13	-9.05	-9.81	-9.46
		21332.	22343.	21769.	18805.	14952.	13019.
		270574.	183563.	244046.	299311.	320451.	329678.

Table 6.4-2

Engineers

OCCUPATION 2 ---- 16 YEARS OF SCHOOLING

Age	Estimated Hours	Predicted Marg Wage and Earn at Est. Hours	Predicted Marg Wage and Earn at Hypothetical Annual Hours				
			1600	2000	2400	2800	3000
25	2161.	3.25	3.77	3.38	3.08	2.85	2.76
		13886.	11928.	13353.	14642.	15829.	16391.
30	2221.	3.82	4.50	4.02	3.68	3.41	3.30
		16794.	14229.	15929.	17467.	18983.	19554.
35	2243.	4.38	5.17	4.63	4.23	3.92	3.79
		19422.	16372.	18327.	20097.	21726.	22490.
40	2239.	4.86	5.74	5.14	4.70	4.35	4.21
		21531.	18167.	20337.	22301.	24108.	24964.
45	2219.	5.23	6.14	5.50	5.03	4.66	4.50
		22939.	19442.	21764.	23865.	25801.	26717.
50	2195.	5.42	6.34	5.68	5.19	4.81	4.65
		23546.	20067.	22464.	24534.	26531.	27576.
55	2178.	5.42	6.31	5.65	5.17	4.79	4.63
		23347.	19977.	22363.	24522.	26510.	27451.
60	2178.	5.20	6.06	5.43	4.96	4.60	4.44
		22418.	19179.	21470.	23544.	25452.	26356.
65	2208.	4.79	5.61	5.03	4.59	4.26	4.11
		20899.	17759.	19881.	21801.	23568.	24405.
		270954.	230317.	257827.	282727.	305646.	316497.

Lawyers and
Judges
OCCUPATION 3 ---- 19 YEARS OF SCHOOLING

Table 6.4-3

Age	Estimated Hours	Predicted Marg Wage and Earn at Est. Hours	Predicted Marg Wage and Earn at Hypothetical Annual Hours 1600	2000	2400	2800	3000
30	2457.	15.40	15.69	20.79	16.83	6.53	0.92
		22292.	5330.	13394.	21216.	26001.	26741.
35	2571.	18.37	19.60	27.17	23.21	10.32	2.92
		30769.	7049.	16723.	27195.	34076.	35396.
40	2599.	20.81	23.42	32.43	27.69	12.29	3.46
		37343.	8423.	19975.	32473.	40679.	42251.
45	2567.	21.96	26.74	35.38	28.58	11.03	1.48
		40378.	9948.	22827.	36124.	44234.	45477.
50	2495.	20.96	29.08	35.02	25.04	6.33	-2.08
		39630.	11612.	24957.	37436.	43813.	44141.
55	2403.	17.42	29.87	30.89	17.56	-0.49	-8.18
		36197.	13398.	26105.	36142.	39528.	38634.
60	2310.	11.66	28.47	23.26	7.86	-7.20	-12.41
		31626.	15278.	26123.	32507.	32484.	30493.
65	2231.	4.30	24.22	13.13	-1.71	-11.74	-14.12
		27029.	17220.	25011.	27237.	24316.	21702.
		368580.	104408.	225570.	343369.	409374.	416532.

Table 6.4-4

Natural
scientists
OCCUPATION 4 ---- 20 YEARS OF SCHOOLING

Age	Esti- mated Hours	Predicted Marg Wage and Earn at Est. Hours	Predicted Marg Wage and Earn at Hypothetical Annual Hours				
			1600	2000	2400	2600	3000
30	2320.	1.41	1.81	1.56	1.38	1.24	1.19
		10088.	8943.	9614.	10199.	10722.	10954.
35	2409.	1.94	2.56	2.20	1.94	1.75	1.67
		14482.	12612.	13558.	14394.	15121.	15463.
40	2375.	2.52	3.30	2.84	2.51	2.26	2.16
		18493.	16273.	17494.	18559.	19510.	19952.
45	2283.	3.06	3.89	3.35	2.96	2.67	2.55
		21556.	19211.	20652.	21909.	23032.	23553.
50	2193.	3.40	4.20	3.62	3.20	2.88	2.75
		22982.	20748.	22304.	23563.	24875.	25438.
55	2162.	3.39	4.15	3.57	3.16	2.85	2.72
		22604.	20501.	22040.	23381.	24580.	25136.
60	2244.	2.99	3.76	3.23	2.86	2.57	2.46
		20683.	18534.	19924.	21137.	22221.	22723.
65	2517.	2.29	3.11	2.67	2.35	2.13	2.02
		17754.	15329.	16479.	17483.	18379.	18794.
		186436.	165778.	178215.	189067.	199756.	203252.

Physicians

OCCUPATION 5 ---- 20 YEARS OF SCHOOLING

Table 6.4-5

Age	Estimated Hours	Predicted Marg Wage and Earn at Est. Hours	Predicted Marg Wage and Earn at Hypothetical Annual Hours				
			1600	2000	2400	2800	3000
30	2916.	-1.93	4.12	1.53	-0.32	-1.63	-2.12
		24940.	24227.	25330.	25552.	25147.	24771.
35	2776.	0.83	7.78	4.84	2.56	0.79	0.06
		34785.	30194.	32692.	34152.	34806.	34890.
40	2770.	3.70	11.19	8.10	5.60	3.56	2.63
		43673.	35404.	39241.	41964.	43781.	44403.
45	2833.	5.33	13.50	10.34	7.73	5.55	4.60
		50228.	39055.	43804.	47403.	50046.	51059.
50	2905.	5.28	14.05	10.78	8.07	5.81	4.82
		52571.	40531.	45474.	49227.	51988.	53049.
55	2920.	3.50	12.60	9.17	6.38	4.10	3.12
		49535.	39573.	43904.	46995.	49078.	49800.
60	2813.	1.06	9.51	5.99	3.25	1.12	0.25
		42119.	36351.	39421.	41247.	42105.	42240.
65	2541.	-0.90	5.52	2.18	-0.23	-1.94	-2.59
		33200.	31414.	32918.	33201.	32826.	32371.
		432528.	357856.	400655.	421407.	432759.	435582.

Hlth.
Technicians

Table 6.4-6

OCCUPATION 6 ---- 14 YEARS OF SCHOOLING

Age	Estimated Hours	Predicted Marg Wage and Earn at Est. Hours	Predicted Marg Wage and Earn at Hypothetical Annual Hours 1600	2000	2400	2600	3000
25	2061.	4.08 8199.	4.05 6325.	4.08 7952.	4.10 9507.	4.11 11229.	4.12 12052.
30	2250.	4.65 10201.	4.61 7198.	4.64 9039.	4.66 10898.	4.68 12764.	4.68 13700.
35	2319.	5.14 11622.	5.09 7942.	5.12 9935.	5.14 12038.	5.16 14099.	5.17 15132.
40	2292.	5.52 12323.	5.46 8525.	5.50 10717.	5.52 12921.	5.54 15134.	5.55 16244.
45	2205.	5.75 12355.	5.70 8892.	5.73 11179.	5.76 13478.	5.78 15786.	5.79 16944.
50	2099.	5.82 11905.	5.78 9013.	5.81 11331.	5.84 13661.	5.86 16000.	5.87 17174.
55	2007.	5.72 11202.	5.69 8877.	5.72 11160.	5.75 13455.	5.77 15759.	5.78 16915.
60	1960.	5.47 10459.	5.45 8496.	5.48 10681.	5.50 12878.	5.53 15084.	5.53 16190.
65	1983.	5.09 9850.	5.07 7992.	5.09 9934.	5.12 11977.	5.14 14029.	5.15 15057.
		163103.	120591.	151730.	182929.	214262.	229973.

College
faculty

Table 6.4-7

OCCUPATION 7 ---- 20 YEARS OF SCHOOLING

Age	Estimated Hours	Predicted Marg Wage and Earn at Est. Hours	Predicted Marg Wage and Earn at Hypothetical Annual Hours				
			1600	2000	2400	2600	3000
30	2141.	5.74	7.12	6.13	4.97	3.77	3.19
		13680.	10184.	12844.	15068.	16816.	17512.
35	2405.	4.03	7.26	5.63	4.04	2.60	1.95
		17891.	13363.	15943.	17873.	19196.	19651.
40	2535.	2.67	7.11	4.98	3.11	1.54	0.86
		20789.	16465.	18378.	20485.	21406.	21644.
45	2482.	2.05	6.94	4.48	2.42	0.78	0.09
		22873.	19053.	21323.	22590.	23317.	23402.
50	2400.	2.21	7.06	4.39	2.22	0.49	-0.22
		24284.	20703.	22977.	24293.	24811.	24837.
55	2324.	3.03	7.64	4.91	2.64	0.82	0.05
		24895.	21125.	23619.	25112.	25789.	25875.
60	2310.	4.20	8.63	6.01	3.72	1.80	0.93
		24738.	20242.	23161.	25095.	26186.	26452.
65	2419.	5.25	9.75	7.51	5.35	3.40	2.52
		24330.	18213.	21666.	24232.	25973.	26564.
		219130.	174408.	203746.	224956.	238831.	243324.

Teachers
(ex college)

Table 6.4-8

OCCUPATION 8 ---- 16 YEARS OF SCHOOLING

Age	Estimated Hours	Predicted Marg Earn and Wage at Est. Hours	Predicted Marg Wage and Earn at Hypothetical Annual Hours 1600	2000	2400	2800	3000
25	2166.	3.48 10682.	5.50 8121.	4.11 10052.	2.61 11394.	1.23 12155.	0.61 12338.
30	2232.	2.47 12963.	5.54 10447.	3.56 12266.	1.74 13317.	0.22 13698.	-0.43 13679.
35	2274.	1.59 14867.	5.44 12553.	3.03 14239.	0.99 15030.	-0.59 15095.	-1.20 14916.
40	2292.	1.13 16288.	5.47 14089.	2.78 15725.	0.59 16381.	-1.05 16271.	-1.69 15996.
45	2285.	1.29 17127.	5.82 14771.	3.00 16521.	0.69 17240.	-1.05 17149.	-1.72 16870.
50	2255.	2.18 17265.	6.53 14465.	3.75 16513.	1.37 17521.	-0.50 17676.	-1.25 17499.
55	2203.	3.71 16576.	7.41 13231.	4.93 15701.	2.59 17195.	0.60 17818.	-0.24 17851.
60	2130.	5.60 14974.	8.13 11305.	6.28 14202.	4.19 16295.	2.19 17554.	1.29 17910.
65	2040.	7.33 12514.	8.39 9022.	7.45 12221.	5.93 14912.	4.15 16932.	3.26 17672.
		202645.	165358.	193218.	209275.	215063.	214745.

Eng. & Science technicians

Table 6.4-9

OCCUPATION 9 ---- 14 YEARS OF SCHOOLING

Age	Estimated Hours	Predicted Marg Wage and Earn at Est. Hours	Predicted Marg Wage and Earn at Hypothetical Annual Hours				
			1600	2000	2400	2600	3000
25	2033.	6.53	8.57	6.75	3.73	0.64	-0.70
		10688.	7340.	10458.	12585.	13448.	13439.
30	2110.	7.09	10.16	8.00	4.42	0.75	-0.83
		13237.	8597.	12403.	14911.	15934.	15924.
35	2144.	7.75	11.58	9.12	5.04	0.87	-0.94
		15354.	9914.	14138.	16997.	18163.	18151.
40	2142.	8.52	12.70	10.00	5.53	0.95	-1.02
		16825.	10871.	15503.	18639.	19917.	19904.
45	2117.	9.27	13.40	10.55	5.83	1.00	-1.09
		17520.	11468.	16355.	19662.	21010.	20997.
50	2080.	9.84	13.60	10.71	5.92	1.02	-1.10
		17423.	11638.	16597.	19953.	21322.	21308.
55	2043.	10.01	13.27	10.46	5.78	0.99	-1.08
		16538.	11362.	16203.	19479.	20815.	20802.
60	2014.	9.68	12.47	9.82	5.43	0.93	-1.01
		15358.	10670.	15217.	18294.	19549.	19537.
65	2006.	8.82	11.26	8.87	4.90	0.84	-0.92
		13803.	9640.	13748.	16528.	17662.	17651.
		221513.	148128.	211244.	253964.	271381.	271283.

Public
Administrators

Table 6.4-10

OCCUPATION 10 ---- 16 YEARS OF SCHOOLING

Age	Estimated Hours	Predicted Marg Wage and Earn at Est. Hours	Predicted Marg Wage and Earn at Hypothetical Annual Hours				
			1600	2000	2400	2600	3000
25	2121.	7.16 12848.	11.63 7560.	8.74 11884.	3.05 14278.	-2.29 14378.	-4.23 13715.
30	2124.	8.73 15809.	14.29 9407.	10.74 14595.	3.74 17534.	-2.81 17658.	-5.20 16845.
35	2132.	10.15 18730.	16.86 11102.	12.67 17224.	4.42 20693.	-3.32 20839.	-6.13 19880.
40	2137.	11.39 21303.	19.12 12590.	14.37 19534.	5.01 23463.	-3.76 23633.	-6.95 22545.
45	2135.	12.48 23187.	20.84 13722.	15.66 21289.	5.46 25576.	-4.10 25757.	-7.58 24571.
50	2119.	13.47 24079.	21.82 14371.	16.40 22296.	5.72 26786.	-4.30 26975.	-7.94 25733.
55	2085.	14.44 23759.	21.96 14463.	16.51 22439.	5.76 26958.	-4.32 27148.	-7.99 25898.
60	2028.	15.32 22146.	21.24 13987.	15.96 21701.	5.57 26072.	-4.18 26255.	-7.73 25047.
65	1945.	15.92 19330.	19.74 13000.	14.84 20169.	5.10 24231.	-3.89 24402.	-7.18 23279.
		253239.	157616.	244539.	293791.	295860.	282244.

Bank
Officers

Table 6.4-11

OCCUPATION 11 ---- 16 YEARS OF SCHOOLING

Age	Estimated Hours	Predicted Marg Wage and Earn at Est. Hours	Predicted Marg Wage and Earn at Hypothetical Annual Hours				
			1600	2000	2400	2600	3000
25	2123.	2.81	3.00	2.84	2.75	2.72	2.71
		13207.	11697.	12860.	13976.	15069.	15511.
30	2236.	1.41	1.36	1.39	1.42	1.45	1.48
		16810.	15929.	16480.	17042.	17519.	17912.
35	2302.	0.41	-0.11	0.23	0.46	0.63	0.70
		20031.	19904.	19933.	20073.	20292.	20424.
40	2327.	0.30	-0.39	0.05	0.34	0.55	0.64
		22816.	22318.	22757.	22839.	23021.	23142.
45	2316.	1.49	1.22	1.38	1.51	1.62	1.67
		24977.	24008.	24522.	25102.	25729.	26057.
50	2280.	4.25	4.58	4.34	4.22	4.16	4.15
		26142.	23161.	24941.	26550.	28325.	29156.
55	2227.	8.46	8.70	8.51	8.45	8.49	8.53
		25867.	20507.	23943.	27331.	30717.	32419.
60	2166.	13.38	12.16	13.02	13.89	14.80	15.27
		23889.	16559.	21695.	27076.	32815.	35822.
65	2107.	17.66	13.85	16.85	19.95	23.18	24.85
		20393.	12417.	18554.	25910.	34532.	39334.
		280321.	255183.	272463.	289624.	307686.	317055.

ealth & Ed.
dministration

Table 6.4-12

OCCUPATION 12 ---- 16 YEARS OF SCHOOLING

Age	Estimated Hours	Predicted Marg Wage and Earn at Est. Hours	Predicted Marg Wage and Earn at Hypothetical Annual Hours				
			1600	2000	2400	2600	3000
25	2573.	1.67	9.28	6.72	3.18	-0.15	-1.52
		14467.	8796.	12055.	14048.	14634.	14464.
30	2359.	4.17	11.18	8.10	3.83	-0.18	-1.83
		16794.	10592.	14518.	16917.	17623.	17417.
35	2312.	5.55	12.93	9.37	4.44	-0.21	-2.11
		19133.	12254.	16797.	19573.	20389.	20152.
40	2344.	5.72	14.38	10.42	4.93	-0.23	-2.35
		21457.	13622.	18672.	21757.	22565.	22401.
45	2421.	4.96	15.35	11.13	5.27	-0.25	-2.51
		23343.	14549.	19942.	23238.	24207.	23925.
50	2498.	3.93	15.76	11.42	5.40	-0.25	-2.57
		24301.	14930.	20465.	23846.	24841.	24552.
55	2525.	3.48	15.54	11.26	5.33	-0.25	-2.54
		24060.	14720.	20177.	23511.	24492.	24207.
60	2452.	4.32	14.72	10.67	5.05	-0.23	-2.40
		22514.	13945.	19114.	22272.	23201.	22931.
65	2243.	6.65	13.39	9.71	4.59	-0.21	-2.19
		19387.	12692.	17397.	20271.	21117.	20871.
		273910.	171045.	234451.	273194.	284590.	281276.

[illegible]
fficials
(ex. trade related)

Table 6.4-13

OCCUPATION 13 ---- 14 YEARS OF SCHOOLING

Age	Estimated Hours	Predicted Marg Wage and Earn at Est. Hours	Predicted Marg Wage and Earn at Hypothetical Annual Hours 1600	2000	2400	2600	3000
25	2318.	4.53 12318.	7.71 7775.	6.24 10501.	4.05 12670.	1.77 13830.	0.72 14077.
30	2387.	3.34 15523.	8.77 10646.	6.22 13673.	3.24 15566.	0.53 16304.	-0.62 16292.
35	2427.	2.06 18331.	9.43 13554.	5.90 16648.	2.23 18273.	-0.73 18558.	-1.92 18290.
40	2438.	1.07 20544.	9.88 16046.	5.51 19132.	1.42 20496.	-1.77 20393.	-2.97 19915.
45	2424.	0.69 21987.	10.15 17664.	5.30 20754.	0.92 21968.	-2.38 21637.	-3.60 21034.
50	2385.	1.10 22484.	10.41 18082.	5.43 21251.	0.96 22499.	-2.43 22164.	-3.68 21548.
55	2327.	2.31 21876.	10.64 17211.	5.95 20539.	1.56 22018.	-1.87 21920.	-3.17 21411.
60	2251.	4.09 20092.	10.71 15234.	6.70 18737.	2.62 20589.	-0.77 20929.	-2.12 20636.
65	2163.	5.98 17229.	10.40 12539.	7.41 16135.	3.90 18397.	0.68 19294.	-0.69 19291.
		268270.	194816.	243315.	271488.	280159.	278270.

[illegible]
(ex. trade related)

Table 6.4-13

OCCUPATION 12 ---- 14 YEARS OF SCHOOLING

Age	Estimated Hours	Predicted Marg Wage and Earn at Est. Hours	Predicted Marg Wage and Earn at Hypothetical Annual Hours				
			1600	2000	2400	2600	3000
25	2318.	4.53 12318.	7.71 7775.	6.24 10581.	4.05 12670.	1.77 13830.	0.72 14077.
30	2387.	3.34 15523.	8.77 10646.	6.22 13673.	3.24 15566.	0.53 16304.	-0.62 16292.
35	2427.	2.06 18331.	9.43 13554.	5.90 16648.	2.23 18273.	-0.73 18558.	-1.92 18290.
40	2438.	1.07 20544.	9.88 16046.	5.51 19132.	1.42 20496.	-1.77 20393.	-2.97 19915.
45	2424.	0.69 21987.	10.15 17664.	5.30 20754.	0.92 21963.	-2.38 21637.	-3.60 21034.
50	2385.	1.10 22484.	10.41 18082.	5.43 21251.	0.96 22499.	-2.43 22164.	-3.63 21548.
55	2327.	2.31 21876.	10.64 17211.	5.95 20539.	1.56 22013.	-1.87 21920.	-3.17 21411.
60	2251.	4.09 20092.	10.71 15234.	6.70 18737.	2.62 20589.	-0.77 20929.	-2.12 20636.
65	2163.	5.98 17229.	10.40 12539.	7.41 16135.	3.90 18397.	0.68 19294.	-0.69 19291.
		268270.	194816.	243315.	271488.	280159.	278270.

Trade-related
Managers

Table 6.4-14

OCCUPATION 14 ---- 14 YEARS OF SCHOOLING

Age	Estimated Hours	Predicted Marg Wage and Earn at Est. Hours	Predicted Marg Wage and Earn at Hypothetical Annual Hours				
			1600	2000	2400	2600	3000
25	2251.	5.04	8.11	6.51	4.10	1.60	0.47
		12422.	8006.	10971.	13105.	14239.	14445.
30	2356.	5.13	9.51	7.63	4.80	1.88	0.55
		15144.	9383.	12859.	15360.	16690.	16930.
35	2416.	5.30	10.77	8.63	5.44	2.13	0.62
		17478.	10623.	14557.	17389.	18895.	19167.
40	2434.	5.64	11.77	9.44	5.95	2.33	0.68
		19210.	11616.	15918.	19015.	20661.	20959.
45	2413.	6.15	12.43	9.97	6.28	2.46	0.72
		20168.	12269.	16813.	20084.	21822.	22137.
50	2364.	6.77	12.69	10.17	6.41	2.51	0.73
		20250.	12517.	17153.	20490.	22263.	22584.
55	2292.	7.37	12.50	10.02	6.32	2.47	0.72
		19452.	12334.	16902.	20190.	21938.	22254.
60	2207.	7.78	11.90	9.54	6.01	2.35	0.69
		17886.	11739.	16087.	19217.	20880.	21181.
65	2116.	7.89	10.94	8.77	5.53	2.16	0.63
		15757.	10792.	14789.	17566.	19195.	19472.
		255574.	160177.	219499.	262202.	284897.	289007.

Computer and Math Spec.

Table 6.4-15

OCCUPATION 15 ----

16 YEARS OF SCHOOLING

Age	Estimated Hours	Predicted Marg Wage and Earn at Est. Hours	Predicted Marg Wage and Earn at Hypothetical Annual Hours				
			1600	2000	2400	2600	3000
25	2082.	7.12	12.15	8.20	2.74	-2.03	-3.81
		15424.	10633.	14798.	16993.	17090.	16499.
30	2121.	7.69	14.21	9.59	3.21	-2.37	-4.45
		18355.	12435.	17306.	19373.	19985.	19295.
35	2162.	8.02	16.16	10.91	3.65	-2.70	-5.07
		21226.	14150.	19692.	22613.	22742.	21955.
40	2197.	8.16	17.90	12.08	4.04	-2.99	-5.61
		23797.	15666.	21802.	25036.	25179.	24308.
45	2220.	8.29	19.28	13.01	4.35	-3.22	-6.04
		25831.	16876.	23486.	26970.	27123.	26185.
50	2224.	8.59	20.21	13.63	4.57	-3.37	-6.33
		27113.	17588.	24516.	28267.	28429.	27445.
55	2204.	9.23	20.61	13.90	4.66	-3.44	-6.45
		27467.	18038.	25103.	28827.	28991.	27988.
60	2153.	10.33	20.45	13.80	4.62	-3.41	-6.41
		26762.	17898.	24909.	28503.	28766.	27771.
65	2069.	11.84	19.74	13.32	4.45	-3.30	-6.19
		24918.	17280.	24047.	27615.	27772.	26811.
		303745.	203106.	282655.	324583.	325432.	315139.

Table 6.5

	Occupation	Years of school	Marginal Wage Rate by Annual Hours and Age								
			1900 Hrs			2300 Hrs			2700 Hrs		
			30	45	60	30	45	60	30	45	60
(1)	Accounts	12	8.59	10.98	-1.16	7.28	9.14	-5.00	5.42	6.63	-6.51
		16	8.98	15.16	5.07	6.43	14.07	-0.86	3.59	11.84	-4.88
		20	6.54	17.93	11.81	3.02	16.67	5.88	-0.07	14.07	0.55
(2)	Engineers	12	3.65	4.57	4.14	3.32	4.16	3.76	3.07	3.84	3.48
		16	4.13	5.64	5.57	3.76	5.14	5.07	3.47	4.74	4.68
		20	4.32	6.44	6.93	3.93	5.86	6.31	3.63	5.41	5.83
(3)	Lawyers	16	27.30	40.23	23.61	25.95	34.78	6.63	13.99	15.40	-8.94
		20	21.81	38.95	31.31	19.68	36.18	16.13	9.57	18.65	-2.79
(4)	Natural scientists	12	2.00	2.80	1.76	1.75	2.46	1.55	1.57	2.21	1.39
		16	1.90	3.30	2.57	1.67	2.90	2.26	1.50	2.60	2.03
		20	1.61	3.47	3.34	1.42	3.05	2.94	1.27	2.73	2.64
(5)	Physicians	20	1.93	10.14	6.21	0.08	7.63	3.55	-1.23	5.55	1.47
(6)	Health technicians	12	4.28	5.11	4.72	4.30	5.14	4.74	4.32	5.16	4.76
		16	4.77	6.11	6.04	4.80	6.14	6.07	4.82	6.16	6.10
		20	4.47	6.13	6.50	4.50	6.16	6.53	4.51	6.19	6.56
(7)	College faculty	16	4.83	3.92	6.11	3.62	2.13	4.34	2.49	0.70	2.75
		20	6.40	5.05	6.64	5.27	2.90	4.26	4.07	1.15	2.24
(8)	Teachers (ex college)	16	4.05	3.66	6.78	2.17	1.21	4.71	0.57	-0.67	2.67
		20	5.25	4.08	6.92	3.36	1.27	4.10	1.61	-0.87	1.60
(9)	Eng. & Science technicians	12	8.69	10.93	9.71	5.34	6.72	5.97	1.62	2.04	1.81
		16	7.66	10.58	10.31	4.71	6.51	6.34	1.43	1.97	1.92
		20	8.55	12.96	13.86	5.26	7.97	8.53	1.60	2.42	2.59

Table (cont'd)

Occupation	Years of school	Marginal Wage Rate by Annual Hours and Age								
		1900 Hrs			2300 Hrs			2700 Hrs		
		30	45	60	30	45	60	30	45	60
(10) Public administrators	12	10.31	13.67	12.66	4.75	6.30	5.84	-1.16	-1.54	-1.43
	16	2.11	17.67	18.01	5.58	8.14	8.30	-1.37	-1.99	-2.03
	20	13.80	22.15	24.58	6.36	10.21	11.45	-1.56	-2.50	-2.80
(11) Bank officers	12	0.25	2.60	11.05	0.39	2.53	12.84	0.50	2.50	14.69
	16	1.38	1.35	12.80	1.41	1.48	13.67	1.45	1.59	14.57
	20	3.34	0.13	12.17	3.22	0.52	12.19	3.17	0.80	12.34
(12) Health & ed. admin.	12	8.61	10.75	9.36	4.68	5.84	5.09	0.71	0.89	0.77
	16	9.05	12.44	11.92	4.92	6.76	6.48	0.75	1.03	0.98
	20	9.61	14.54	15.34	5.23	7.90	8.34	0.79	1.20	1.27
(13) Misc. managers and officials (ex trade-related)	12	6.09	5.75	7.02	3.22	1.66	3.58	0.59	-1.54	0.48
	16	8.59	8.14	9.37	5.34	2.56	3.94	2.05	-1.86	-0.63
	20	8.86	8.93	9.43	6.33	3.37	3.26	3.40	-1.19	-1.72
(14) Trade-related managers	12	7.63	9.57	8.78	5.14	6.45	5.92	2.40	3.01	2.76
	16	10.44	14.23	14.19	7.04	9.60	9.57	3.28	4.47	4.46
	20	9.62	14.25	15.45	6.49	9.61	10.42	3.03	4.48	4.86
(15) Computer & math spec.	12	8.90	11.31	11.23	3.88	4.93	4.89	-0.92	-1.17	-1.16
	16	11.03	14.97	15.88	4.81	6.52	6.92	-1.14	-1.54	-1.64
	20	10.93	15.84	17.94	4.76	6.90	7.82	-1.13	-1.63	-1.85

Table 6.6

	At Estimated Actual Hours										At 2400 Hours				
	Age at Peak Earnings	Peak Earnings	Hours at Peak Earnings	Marg. Wages at Peak Earnings	Ratio to Peak Earnings Year Value						Age at Peak Earnings	Peak Earnings	Peak Wages	Ratio to Peak Earnings Ye Value	
					Earnings at		Marg. Wage at		Hours at					Wage at	
					30	65	30	65	30	65				30	65
Accountants	49	24,178	2194	13.52	.67	.88	.53	-.46	1.0	.95	48	26,813	12.63	.45	-.72
Engineers	51	23,570	2191	5.44	.71	.89	.70	.88	1.01	1.01	52	24,696	5.20	.71	.88
Lawyers and Judges	46	40,511	2556	21.95	.55	.68	.70	.20	.97	.87	50	37,436	25.04	.67	-.07
Natural Scientists	51	23,048	2181	3.43	.43	.77	.41	.67	1.06	1.15	52	23,802	3.22	.43	.73
Physicians	50	52,571	2905	5.28	.47	.63	-.37	-.17	1.0	.87	50	49,227	8.07	-.04	-.03
Health Technicians	43	12,412	2244	5.67	.82	.79	.82	.90	1.0	.88	50	13,661	5.84	.80	.88
College Faculty	56	24,918	2314	3.25	.55	.98	1.77	1.62	.92	1.05	57	25,209	2.99	1.66	1.79
Teachers (ex college)	48	17,302	2270	1.74	.75	.72	1.42	4.21	.98	.90	50	17,521	1.37	1.27	4.33
Eng. & Science Technicians	47	17,573	2103	9.53	.75	.79	.74	.93	1.0	.95	49	19,956	5.92	.75	.83

	At Estimated Actual Hours										At 2400 Hours				
	Age at Peak Earnings	Peak Earnings	Hours at Peak Earnings	Marg. Wages at Peak Earnings	Ratio to Peak Earnings Year Value						Age at Peak Earnings	Peak Earnings	Peak Wages	Ratio to Peak Earnings Year Value	
					Earnings at		Marg. Wage at		Hours at					Wage at	
					30	65	30	65	30	65				30	65
Public Administrators	51	24,116	2114	13.67	.66	.80	.64	1.16	1.10	.92	53	27,018	5.77	.65	.90
Bank Officers	52	26,227	2260	5.78	.64	.78	.24	3.06	.99	.93	56	27,356	9.46	.15	2.11
Health & Ed. Administrators	52	24,355	2517	3.64	.69	.80	1.15	1.83	.94	.89	51	23,855	5.41	.71	.85
Misc. Managers and Officials (ex trade-related)	50	22,484	2385	1.10	.69	.77	3.04	5.44	1.0	.91	50	22,499	0.96	3.38	4.06
Trade-related Managers	48	20,325	2387	6.52	.75	.78	.79	1.21	.99	.89	50	20,490	6.41	.75	.86
Computer and Math Spec.	54	27,477	2210	9.07	.75	.91	.85	1.31	.96	.94	56	28,845	4.66	.69	.96

Table 7.1

Alternative Estimates of the Gross Capital Values of a Choice of a Medical Career

5 Percent Discount Rate
No Mortality Adjustment

SUMMARY OF PHYSICIAN RETURNS

		V^u	V^{ANP}	V^{ANL}	V^{ALP}	V^{ALL}
Accountants	1	161953.	115198.	142093.	70824.	64425.
Engineers	2	161574.	120262.	142193.	73206.	66325.
Lawyer/Judges	3	63948.	21801.	57518.	10670.	12288.
Natural Scien.	4	246091.	232783.	230139.	201568.	164241.
Physicians	5	0.	0.	0.	0.	0.
Health Tech.	6	269425.	202481.	247955.	204524.	170531.
College Faculty	7	213397.	191832.	203652.	166029.	140724.
Teachers	8	229882.	216746.	212571.	166317.	139131.
Eng. & Sci. Tech	9	211015.	165968.	185550.	114539.	98502.
Public Admin.	10	169289.	147059.	144595.	69206.	58559.
Bank Officers	11	152207.	118986.	136367.	67414.	65307.
Health & Ed Ad	12	158617.	151820.	148004.	102829.	91164.
Misc. Managers	13	164258.	151242.	153036.	95001.	95081.
Trade-re Man	14	176954.	147948.	165071.	104252.	104654.
Comp & Math Tech.	15	128782.	115436.	108479.	20442.	27681.

Table 7.2

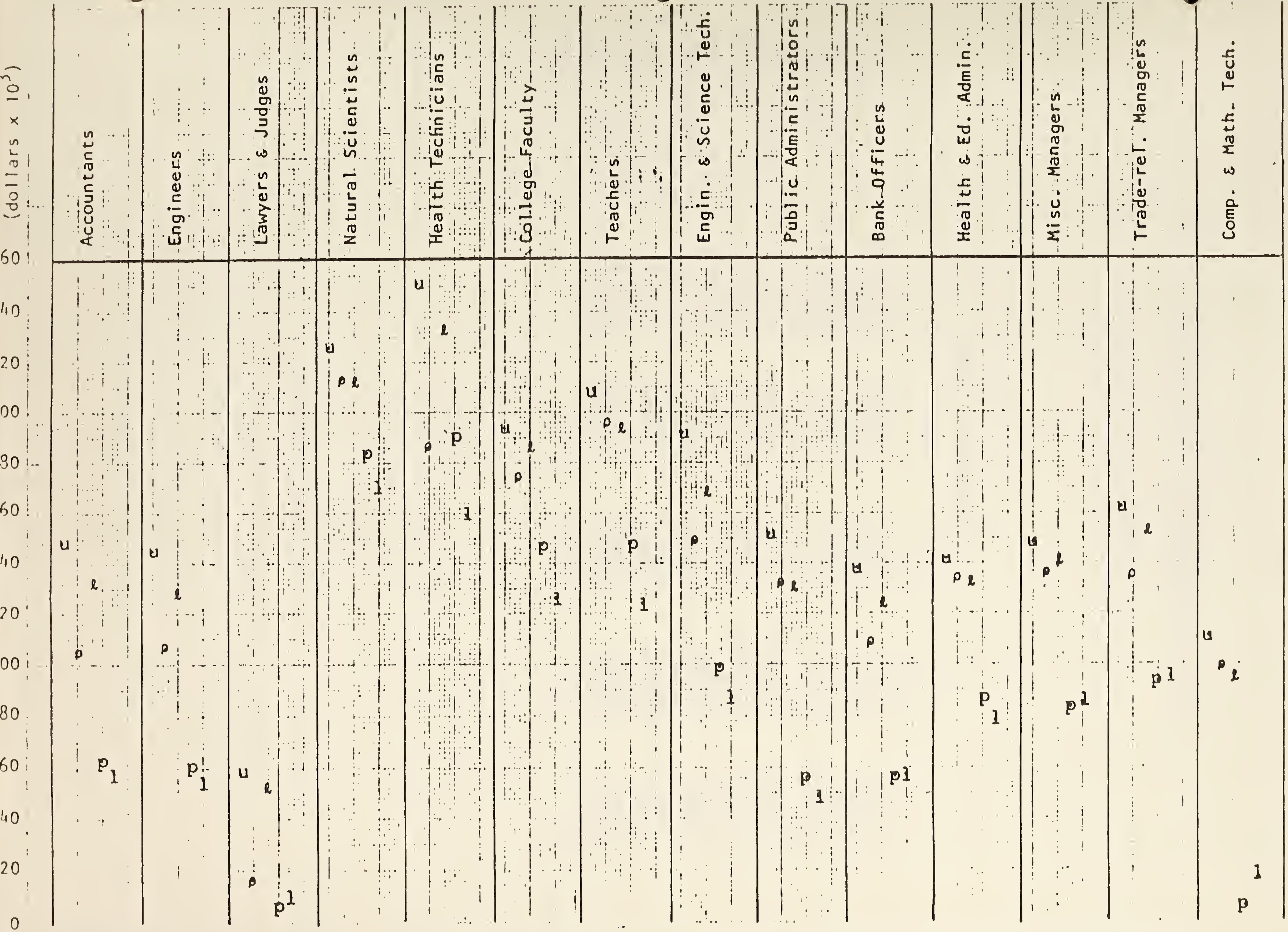
Alternative Estimates of the Gross Capital Values of the Choice of a Medical Career

5 Percent Discount Rate
Population Mortality Adjustment

SUMMARY OF PHYSICIAN RETURNS

		V^{u}	V^{ANP}	V^{ANL}	V^{ALP}	V^{ALL}
Accountants	1	147712.	103006.	129718.	61688.	57318.
Engineers	2	147102.	108001.	129483.	63413.	58599.
Lawyer/Judges	3	57619.	17405.	52035.	8209.	10130.
Natural Sci.	4	229379.	217078.	215010.	188240.	153428.
Physicians	5	0.	0.	0.	0.	0.
Health Tech	6	247214.	183371.	227936.	185322.	156171.
College Fac.	7	198914.	178236.	190234.	154638.	131098.
Teachers	8	210765.	198595.	195120.	150524.	126700.
Eng. & Sci Tech	9	192288.	149953.	169124.	100296.	87950.
Public Admin.	10	154610.	134514.	132131.	60309.	51913.
Bank Officers	11	138720.	108773.	124426.	58586.	58161.
Health & Ed Ad	12	144238.	137980.	134537.	91214.	81127.
Misc. Managers	13	148630.	135917.	138590.	82644.	84703.
Trade-re Man.	14	160079.	132788.	149465.	90611.	93328.
Comp & Math Tech	15	116760.	104514.	98247.	14128.	22666.

Figure 7. Alternative Adjustments of the Gross Capita Values of Choice of a Medical Career, r=.05,Occ. ortality



Key: u-unadjusted, ρ-Paasche nonlinear adjusted, ℓ-Lespeyre nonlinear adjusted, p-Paasche linear adjusted, l-Lespeyre linear adjusted.

Table 7.3

Alternative Estimates of the Gross Capital Values of Choice of a Medical Career

5 Percent Discount Rate
Occupation Mortality Adjustment

SUMMARY OF PHYSICIAN RETURNS

		V^u	V^{ANP}	V^{ANL}	V^{ALP}	V^{ALL}
Accountants	1	149383.	104555.	131230.	63071.	58385.
Engineers	2	145543.	105872.	127774.	60646.	56467.
Lawyer/Judges	3	57922.	17520.	52265.	8149.	10081.
Natural Sci.	4	226090.	213362.	211586.	183514.	149638.
Physicians	5	0.	0.	0.	0.	0.
Health Tech.	6	250518.	186934.	231053.	188878.	158812.
College Faculty	7	194050.	172959.	185280.	148341.	125822.
Teachers	8	209042.	196519.	193255.	147554.	124412.
Eng & Sci Tech	9	191815.	148784.	168455.	98666.	86785.
Public Admin	10	152328.	131589.	129660.	56258.	48951.
Bank Officers	11	138229.	107711.	123803.	57256.	57133.
Health & Ed Ad	12	141862.	135441.	132084.	87989.	78382.
Misc Managers	13	149238.	136487.	139097.	82820.	84867.
Trade-re Man	14	162415.	135092.	151693.	92886.	95195.
Comp & Math Tech	15	111479.	98772.	92812.	6425.	16790.

Table 7.4

Alternative Adjustments of the Gross Capital Values of Choice of a Medical Career

10 Percent Discount Rate
Occupation Mortality Adjustment

SUMMARY OF PHYSICIAN RETURNS

		V^{u}	V^{ANP}	V^{ANL}	V^{ALP}	V^{ALL}
Accountants	1	36264.	20232.	32282.	-4700.	3407.
Engineers	2	33403.	14536.	29456.	-7309.	1088.
Lawyer/Judges	3	14182.	-3711.	13835.	-5799.	-3120.
Natural Sci.	4	83415.	79010.	80676.	68695.	56128.
Physicians	5	0.	0.	0.	0.	0.
Health Tech	6	72141.	36574.	68130.	37692.	40303.
College Faculty	7	70135.	59226.	68878.	51400.	43291.
Teachers	8	60037.	53375.	56716.	30010.	29343.
Eng & Sci Tech	9	46445.	27064.	40896.	-3188.	8609.
Public Admin	10	38022.	32168.	32595.	-6021.	697.
Bank Officers	11	32537.	19067.	29625.	-6567.	2898.
Health & Ed Ad	12	31592.	30037.	29556.	5860.	7457.
Misc. Managers	13	28539.	18959.	26847.	-7916.	5359.
Trade-re Man	14	31882.	18432.	30086.	-7651.	7686.
Comp & Math Tech	15	20181.	16053.	15800.	-30540.	-14949.

Table 7.5

GROSS AND NET RETURNS TO PHYSICIAN TRAINING RECOGNIZING NONLINEARITY OF HOUR-EARNINGS RELATIONSHIP

				NET CAPITAL VALUES OF PHYSICIAN TRAINING		
		V^{ANG}	Modal Years of Schooling	at Lower Bound Schooling Cost	at Upper Bound Schooling Cost	at "Full Cost" Medical School Tuition
1.	Accountants	$113.9	16	$108.9	94.9	76.0
2.	Engineers	119.6	16	114.6	100.6	81.7
3.	Lawyers & Judges	28.0	19	25.7	11.7	-7.2
4.	Natural Scientists	214.1	20	212.6	198.6	180.0
5.	Physicians	0	20	0	0	0
6.	Health Technicians	214.5	14	208.0	194.0	175.0
7.	College Faculty	180.2	20	178.7	164.7	145.8
8	Other Teachers	193.4	16	188.4	174.4	155.5
.	Eng. & Science Technicians	146.5	14	140.0	126.0	107.0
10.	Public Administrators	111.7	16	106.7	92.7	73.8
11.	Bank Officers	118.9	16	113.9	99.9	81.0
12.	Health & Ed. Administrators	130.3	16	125.3	111.3	92.4
13.	Misc. Managers	133.0	14	126.5	112.5	93.5
14.	Trade-Related Managers	137.5	14	131.0	117.0	98.0
15.	Computer & Math Specialists	80.9	16	75.9	61.9	43.0

Table 7.6

PUBLIC AND PRIVATE UNDERGRADUATE, GRADUATE AND MEDICAL SCHOOL TUITIONS IN 1974-75

	UNDERGRADUATE	AD GRADUATE	MEDICAL
Universities			
Public	$ 597	$ 690	$ 968
Private	2,534	2,624	2,940
Other 4-year Institutions			
Public	437	558	
Private	2,035	2,013	
Two-year Institutions			
Public	376		
Private	1,341		

Table 7.7

GROSS AND NET RETURNS TO PHYSICIAN TRAINING INAPPROPRIATELY ASSUMING LINEAR HOURS-EARNINGS RELATIONSHIP

		NET CAPITAL VALUES OF PHYSICIAN TRAINING		
	V^{ALG}	at Lower Bound Schooling Cost	at Upper Bound Schooling Cost	at "Full Cost" Medical School Tuition
1.	$ 61.2	56.2	42.2	23.3
2.	59.0	54.0	40.0	21.1
3.	9.2	6.9	-7.1	-26.0
4.	165.6	164.1	150.1	131.2
5.	0	0	0	0
6.	173.9	167.4	153.4	134.4
7.	136.5	135.0	121.0	102.1
8.	135.7	130.7	116.7	97.8
9.	93.4	86.9	72.9	53.9
10.	52.8	47.8	33.8	14.9
11.	57.9	52.9	38.9	20.0
12.	83.1	78.1	64.1	45.2
13.	84.8	78.3	64.3	45.3
14.	95.2	88.7	74.7	55.7
15.	12.7	7.7	-6.3	-25.2

Table 8.1

Primary Specialties	Occupation	No. of Observations	Annual Earnings	Annual Hours
5	General/Family Practice	304	$46,220 (28,951 - 73,791)	3035 (771)
6	General Surgery	280	58,240 (37,810 - 89,710)	3044 (728)
7	Internal Medicine	231	54,211 (34,282 - 85,725)	3008 (770)
11	Obstetrics/ Gynecology	294	62,709 (39,354 - 99,924)	2961 (799)
15	Pediatric Surgery	250	47,771 (32,480 - 70,262)	2928 (658)
16	Child Psychiatry/ Psychiatry	317	45,356 (28,626 - 71,861)	2546 (665)
1&3	Allergy/Dermatology	190	55,604 (34,032 - 90,849)	2343 (638)
2&4&7	Cardiovascular/ Gastroenterology/ Urology	233	61,419 (37,933 - 99,446)	2949 (697)
8&13	Neurological Surgery/Orthopedic Surgery	194	69,838 (43,635 - 111,776)	2952 (747)
12&14	Opthamology/ Otolaryngotology	216	53,999 (32,519 - 89,666)	2530 (705)
	Total Sample	2509	54,893	2842

Note: The following specialties, surveyed independently, have been grouped together: Allergy and Dermatology; Neurological Surgery and Orthopedic Surgery; Opthamology and Otolaryngology; and Cardiovascular, Gastroenterology, and Urology.

N income from practice (ln)

Table 8.2

(standard deviations in parentheses)

Estimated 1976 HCFA Physician Net Earnings Equations

Specialty Variable	(1) General/ Family Practice	(2) General Surgery	(3) Internal Medicine	(4) Obstetrics/ Gynecology	(5) Pediatric Surgery/ Pediatrics	(6) Child Psychiatry/ Psychiatry
Experience	.3155	.2780	.3097	.3065	.3116	.2271
	(.1071)	(.1324)	(.1188)	(.1432)	(.1123)	(.1255)
Experience squared	-.0766	-.0519	-.0792	-.0819	-.0732	-.0492
	(.0211)	(.0252)	(.0248)	(.0298)	(.0237)	(.0258)
Annual hours (ln)	.2315	.1057	.2802	.3262	.1801	.6102
	(.0987)	(.1088)	(.0999)	(.0888)	(.1101)	(.0961)
Annual weeks (ln)	.0750	-.5368	-.1726	-1.0516	.1124	.4137
	(.5550)	(.6206)	(.5263)	(.4998)	(.5806)	(.4892)
Age at M.D.	-.0148	-.0066	.0091	-.0187	.0068	-.0076
	(.0078)	(.0117)	(.0098)	(.0097)	(.0098)	(.0080)
Solo Practice	-.1069	-.1823	-.2322	-.1822	-.1118	-.1442
	(.0574)	(.0533)	(.0596)	(.0539)	(.0494)	(.0814)
Incorporated	.1991	.1292	.2103	.0721	.1548	.1400
	(.0578)	(.0524)	(.0538)	(.0519)	(.0506)	(.0524)
GT average hours	.1099	.0565	-.0664	-.1824	-.1018	.0662
	(.0760)	(.0923)	(.0803)	(.0856)	(.0693)	(.0787)
LT average hours	.0465	-.1154	-.0333	.0032	.0264	.1064
	(.0698)	(.0593)	(.0726)	(.0622)	(.0606)	(.0603)
Board certification	-.0233	.1013	.0583	.1290	.1178	.0419
	(.0762)	(.0536)	(.0537)	(.0568)	(.0546)	(.0503)
Intercept	8.7768	12.0691	8.9266	12.7711	8.3994	4.3774
	(2.1199)	(2.2319)	(2.0352)	(1.888)	(2.1394)	(1.9122)
R^2	.207	.168	.292	.245	.186	.227

Net income from practice (ln) (cont'd)

Specialty Variable	(7) Allergy/ Derma-tology	(8) Cardiovascular/ Gastroenterology/ Urology	(9) Neurological Surgery/Ortho-pedic Surgery	(10) Opthamology/ Otolaryngoto-logy
Experience	.2271	.5844	-.1490	.2879
	(.1586)	(.1448)	(.2240)	(.1574)
Experience squared	-.0592	-.1091	.0090	-.0806
	(.0304)	(.0292)	(.0480)	(.0321)
Annual hours (ln)	.2467	-.1463	.1648	.4835
	(.1313)	(.1301)	(.1319)	(.1224)
Annual weeks (ln)	-.6699	2.0899	-1.9277	-1.0743
	(.6547)	(.5865)	(.6804)	(.6241)
Age at M.D.	-.0101	.0271	-.0203	-.0301
	(.0118)	(.0143)	(.0157)	(.0128)
Solo Practice	-.0116	-.3344	-.1268	-.0734
	(.0822)	(.0599)	(.0670)	(.0705)
Incorporated	.2423	.0451	.0379	.0599
	(.0703)	(.0625)	(.0716)	(.0659)
GT average hours	.0186	.2051	.0724	-.0232
	(.1585)	(.1035)	(.0971)	(.1149)
LT average hours	-.0071	.0925	-.1013	.1582
	(.0930)	(.0782)	(.0803)	(.0813)
Board certification	.1575	.0792	.1928	.0465
	(.0677)	(.0643)	(.0751)	(.0732)
Intercept	11.5587	2.8257	17.9852	11.8741
	(2.5301)	(2.3457)	(2.7623)	(2.4086)
R^2	.215	.229	.187	.249

Table 8.3
MARGINAL PHYSICIAN HOURLY EARNINGS--1976
BY SPECIALTY, AGE AND ANNUAL HOURS

	Annual Hours				
General/Family Practice					
Age	1600	2000	2400	2800	3000
30	$5.28	$4.45	$3.87	$3.44	$3.26
35	5.88	4.96	4.31	3.83	3.63
40	6.31	5.31	4.62	4.10	3.89
45	6.51	5.48	4.77	4.23	4.02
50	6.46	5.45	4.73	4.20	3.99
55	6.18	5.20	4.52	4.02	3.81
60	5.68	4.79	4.16	3.70	3.51
65	5.03	4.24	3.68	3.27	3.10
70	4.29	3.61	3.14	2.79	2.64
General Surgery					
Age					
30	$2.93	$2.40	$2.04	$1.78	$1.67
35	3.26	2.67	2.27	1.97	1.86
40	3.53	2.89	2.45	2.14	2.01
45	3.72	3.05	2.59	2.25	2.12
50	3.82	3.13	2.66	2.32	2.18
55	3.83	3.14	2.66	2.32	2.18
60	3.74	3.06	2.60	2.26	2.13
65	3.55	2.91	2.47	2.15	2.02
70	3.29	2.70	2.29	1.99	1.88
Internal Medicine					
Age					
30	$7.57	$6.45	$5.66	$5.06	$4.82
35	8.40	7.15	6.27	5.61	5.34
40	8.95	7.62	6.68	5.98	5.69
45	9.17	7.81	6.85	6.13	5.83
50	9.03	7.69	6.74	6.03	5.74
55	8.54	7.28	6.38	5.71	5.43
60	7.77	6.62	5.80	5.19	4.94
65	6.79	5.79	5.07	4.54	4.32
70	5.71	4.86	4.26	3.82	3.64
Obstetrics/Gynecology					
Age					
30	$9.32	$8.02	$7.09	$6.39	$6.10
35	10.30	8.87	7.84	7.07	6.75
40	10.93	9.40	8.32	7.50	7.16
45	11.13	9.58	8.47	7.63	7.29
50	10.88	9.36	8.28	7.46	7.12
55	10.20	8.78	7.76	7.00	6.68
60	9.19	7.91	6.99	6.30	6.02
65	7.94	6.83	6.04	5.45	5.20
70	6.59	5.67	4.81	4.33	4.14
Pediatric Surgery/Pediatrics					
Age					
30	$3.90	$3.25	$2.80	$2.47	$2.33
35	4.35	3.62	3.12	2.75	2.60
40	4.67	3.89	3.35	2.95	2.79
45	4.84	4.03	3.47	3.06	2.89
50	4.83	4.03	3.47	3.06	2.89
55	4.65	3.88	3.34	2.94	2.78
60	4.32	3.60	3.10	2.73	2.58
65	3.86	3.22	2.77	2.44	2.31
70	3.33	2.78	2.39	2.11	1.99

	Annual Hours				
Child Psychiatry/Psychiatry Age	1600	2000	2400	2800	3000
30	$12.13	$11.12	$10.36	$9.75	$9.50
35	13.16	12.07	11.24	10.58	10.30
40	13.93	12.77	11.90	11.20	10.91
45	14.39	13.19	12.29	11.57	11.26
50	14.51	13.30	12.39	11.66	11.35
55	14.26	13.07	12.18	11.47	11.16
60	13.69	12.55	11.68	11.00	10.71
65	12.81	11.74	10.94	10.30	10.03
70	11.70	10.73	9.99	9.41	9.16
Allergy/Dermatology Age					
30	$6.22	$5.26	$4.58	$4.08	$3.87
35	6.70	5.67	4.94	4.40	4.17
40	7.01	5.93	5.17	4.60	4.37
45	7.13	6.02	5.25	4.68	4.44
50	7.03	5.94	5.18	4.61	4.38
55	6.73	5.69	4.96	4.42	4.19
60	6.26	5.29	4.61	4.10	3.90
65	5.65	4.77	4.16	3.70	3.52
70	4.95	4.18	3.65	3.25	3.08
Neurological Surgery/ Orthopedic Surgery Age					
30	$7.19	$5.97	$5.13	$4.51	$4.26
35	6.72	5.57	4.79	4.21	3.97
40	6.30	5.23	4.49	3.95	3.73
45	5.93	4.93	4.23	3.72	3.51
50	5.62	4.66	4.00	3.52	3.32
55	5.34	4.43	3.81	3.35	3.16
60	5.10	4.23	3.63	3.20	3.02
65	4.89	4.06	3.49	3.07	2.89
70	4.71	3.91	3.36	2.95	2.79
Opthamology/Otolaryngotology Age					
30	$12.14	$10.82	$9.85	$9.10	$8.78
35	13.31	11.86	10.79	9.97	9.62
40	14.01	12.48	11.36	10.49	10.12
45	14.16	12.62	11.49	10.61	10.24
50	13.75	12.25	11.15	10.30	9.94
55	12.82	11.43	10.40	9.61	9.27
60	11.49	10.24	9.32	8.60	8.30
65	9.88	8.81	8.02	7.40	7.14
70	8.17	7.28	6.62	6.12	5.90

Table 8.4

Annual Physician Earnings--1976

BY SPECIALTY, AGE AND ANNUAL HOURS

General/Family Practice Age	Annual Hours 1600	 2000	 2400	 2800	 3000
30	$36,501	$38,437	$40,094	$41,550	$42,219
35	40,664	42,820	44,666	46,289	47,034
40	43,597	45,908	47,887	49,627	50,426
45	44,985	47,370	49,413	51,208	52,033
50	44,671	47,040	49,068	50,851	51,670
55	42,697	44,961	46,900	48,604	49,386
60	39,276	41,358	43,141	44,709	45,429
65	34,768	36,612	38,190	39,578	40,215
70	29,624	31,195	32,540	33,722	34,265
General Surgery Age					
30	$44,376	$45,435	$46,319	$47,079	$47,424
35	49,302	50,478	51,460	52,305	52,688
40	53,373	54,647	55,710	56,625	57,039
45	56,300	57,643	58,765	59,730	60,167
50	57,866	59,247	60,399	61,391	61,840
55	57,951	59,334	60,488	61,482	61,931
60	56,551	57,900	59,027	59,996	60,435
65	53,769	55,052	56,123	57,045	57,462
70	49,818	51,006	51,999	52,853	52,239
Internal Medicine Age					
30	$43,241	$46,031	$48,444	$50,582	$51,570
35	47,947	51,041	53,079	56,087	57,182
40	51,101	54,399	57,250	59,777	60,943
45	52,351	55,728	58,649	61,238	62,433
50	51,545	54,871	57,747	60,296	61,473
55	48,782	51,929	54,651	57,064	58,177
60	44,375	47,238	49,714	51,908	52,922
65	38,798	41,302	43,466	45,385	46,271
70	32,604	34,707	36,526	38,139	38,883
Obstetrics/Gynecology Age					
30	$45,727	$49,180	$52,193	$54,885	$56,134
35	50,535	54,351	57,682	60,657	62,037
40	53,607	57,665	61,188	64,344	65,809
45	54,584	58,706	62,304	65,517	67,008
50	53,348	57,376	60,892	64,032	65,490
55	50,045	53,824	57,123	60,068	61,436
60	45,068	48,471	51,441	54,094	55,326
65	38,949	41,890	44,457	46,750	47,814
70	32,313	34,753	36,882	38,785	39,667
Pediatric Surgery/Pediatrics Age					
30	$34,676	$36,098	$37,304	$38,354	$38,834
35	38,640	40,225	41,568	42,738	43,273
40	41,512	43,214	44,657	45,915	46,489
45	42,995	44,758	46,253	47,555	48,150
50	42,931	44,692	46,184	47,484	48,078
55	41,328	43,023	44,460	45,712	46,284
60	38,357	39,930	41,264	42,426	42,956
65	34,320	35,728	36,921	37,960	38,435
70	29,604	30,818	31,847	32,744	33,153

	Annual Hours				
Child Psychiatry/Psychiatry	1600	2000	2400	2800	3000
Age					
30	$31,809	$36,449	$40,739	$44,757	$46,681
35	34,514	39,548	44,202	48,562	50,650
40	36,535	41,864	46,791	51,406	53,616
45	37,733	43,237	48,326	53,092	55,375
50	38,034	43,582	48,711	53,516	56,817
55	37,395	42,850	47,892	52,616	54,878
60	35,883	41,118	45,957	50,489	52,660
65	33,585	38,484	43,013	47,255	49,287
70	30,680	35,155	39,292	43,168	45,024
Allergy/ Dermatology					
Age					
30.	$40,321	$42,604	$44,564	$46,292	$47,087
35	43,464	45,925	48,038	49,900	50,757
40	45,484	48,058	50,270	52,219	63,115
45	46,210	48,825	51,072	53,052	53,963
50	45,577	48,157	50,373	52,326	53,225
55	43,644	46,114	48,236	50,107	50,967
60	40,568	42,864	44,837	46,575	47,375
65	36,613	38,685	40,465	42,034	42,756
70	32,077	33,892	35,082	36,826	37,459
Neurological Surgery/ Orthopedic Surgery					
Age					
30	$69,830	$72,446	$74,657	$76,578	$77,454
35	65,199	67,642	69,705	71,499	72,317
40	61,151	63,442	65,378	67,060	67,827
45	57,612	59,770	61,594	63,179	63,901
50	54,524	56,567	58,292	59,792	60,476
55	51,837	53,779	55,419	56,845	57,496
60	49,502	51,356	52,923	54,285	54,906
65	47,489	49,269	50,772	52,078	52,674
70	45,762	47,477	48,925	50,184	50,758
Opthamology/Otolaryngotology					
Age					
30	$40,188	$44,767	$48,892	$52,675	$54,462
35	44,040	49,057	53,578	57,724	59,681
40	46,360	51,642	56,400	60,764	62,826
45	46,868	52,207	57,018	61,430	63,513
50	45,502	50,686	55,356	59,640	61,662
55	42,440	47,275	51,632	55,627	57,514
60	38,013	42,344	46,246	49,824	51,514
65	32,707	36,433	39,790	42,869	44,323
70	27,028	30,107	32,882	35,426	36,627

Table 8.5

	At Estimated Actual Hours										At 2400 Hours				
	Age at Peak Earnings	Peak Earnings	Hours at Peak Earnings	Marg. Wages at Peak Earnings	Ratio to Peak Earnings Year Value						Age at Peak Earnings	Peak Earnings	Peak Wages	Ratio to Peak Earnings Year Value	
					Earnings at		Marg. Wage at		Hours at					Wage at	
					30	65	30	65	30	65				30	65
Gen/Fam Prac	46	$52,000	2971	$4.05	.84	.75	.71	.84	1.18	.90	47	$49,503	$4.78	.81	.77
Gen Surg	52	62,154	3039	2.16	.76	.92	.81	1.01	.95	.91	53	60,640	2.67	.76	.93
Int Med	45	62,322	2981	5.86	.83	.72	.83	.80	1.0	.91	46	58,656	6.85	.83	.74
Obs/Gyn	45	65,964	2859	7.53	.85	.70	.81	.75	1.05	.94	45	62,304	8.47	.84	.71
Ped Surg/Peds	47	47,938	2866	3.01	.81	.78	.76	.86	1.08	.91	47	46,430	3.48	.80	.80
Ch Psy/Psy	49	50,356	2533	12.13	.83	.82	.84	.93	1.0	.88	49	48,726	12.39	.84	.88
All/Derm	45	50,609	2313	5.40	.88	.78	.85	.83	1.04	.94	45	51,072	5.25	.87	.79
Neur/Ortho Surg	30	75,215	2511	4.94	1.0	.70	1.0	.74	1.0	.91	30	74,657	5.13	1.0	.68
Opth/Otol	44	59,886	2651	10.92	.80	.61	.93	.80	.86	.77	44	57,074	11.50	.86	.70

Table 9.1

General Practice

I	IA	Y	HB	G0(1)	G0(2)	G0(3)	G1(1)	G1(2)	G1(3)
1	30	43791.	3513.	0.03246555	0.00004744	0.00000003	1.63199997	2.16199970	2.69999931
1	[illegible]	47735.	3198.	0.04073341	0.00006386	0.00000011	1.65999985	2.19600010	2.73999977
1	40	50589.	3042.	0.04653939	0.00007575	0.00000014	1.67599960	2.21599961	2.76200008
1	45	51940.	2977.	0.04935082	0.00008163	0.00000015	1.68400002	2.22799999	2.77400017
1	50	51481.	2953.	0.04952732	0.00008243	0.00000015	1.68400002	2.22599983	2.77400017
1	55	49085.	2922.	0.04796187	0.00008045	0.00000015	1.68200016	2.22399999	2.77199934
1	60	44863.	2842.	0.04559510	0.00007826	0.00000015	1.67599964	2.21999931	2.77199936
1	65	39165.	2676.	0.04367030	0.00007825	0.00000016	1.67199993	2.21999931	2.77400017
1	70	32543.	2401.	0.04268416	0.00008295	0.00000018	1.67199993	2.22599983	2.78800011

General Surgery

I	IA	Y	HB	G0(1)	G0(2)	G0(3)	G1(1)	G1(2)	G1(3)
2	30	47211.	2875.	0.02157961	0.00003664	0.00000007	1.58799934	2.13000011	2.67999935
2	35	52621.	2964.	0.02297816	0.00003814	0.00000007	1.59599972	2.13399983	2.68200016
2	40	57095.	3028.	0.02414251	0.00003943	0.00000007	1.59999943	2.13999939	2.68599987
2	45	60293.	3060.	0.02509359	0.00004059	0.00000007	1.60599995	2.14199924	2.68799973
2	50	61955.	3053.	0.02586848	0.00004198	0.00000008	1.60799980	2.14599991	2.69199944
2	55	61938.	3003.	0.02651738	0.00004358	0.00000008	1.61199951	2.14999962	2.69799995
2	60	60230.	2905.	0.02709882	0.00004566	0.00000009	1.61399937	2.15600014	2.70599937
2	65	56958.	2760.	0.02767942	0.00004846	0.00000010	1.61800003	2.16199970	2.71599960
2	70	52374.	2569.	0.02833112	0.00005234	0.00000011	1.62199974	2.17199993	2.72799969

Internal Medicine

I	IA	Y	HB	G0(1)	G0(2)	G0(3)	G1(1)	G1(2)	G1(3)
3	30	51473.	2980.	0.05909562	0.00009767	0.00000018	1.70399952	2.24599934	2.79399967
3	35	57267.	3016.	0.06459177	0.00010581	0.00000020	1.71599960	2.25599957	2.80399992
3	40	61023.	3014.	0.06890368	0.00011294	0.00000021	1.72200012	2.26399994	2.81199932
3	45	62322.	2981.	0.07153171	0.00011821	0.00000022	1.72799969	2.26799965	2.81799934
3	50	61044.	2926.	0.07206053	0.00012077	0.00000023	1.72799969	2.27199935	2.82199955
3	55	57381.	2856.	0.07024044	0.00011987	0.00000023	1.72599983	2.26999950	2.82199955
3	60	51799.	2779.	0.06605561	0.00011507	0.00000023	1.71999931	2.26599979	2.81799984
3	65	44934.	2702.	0.05976355	0.00010631	0.00000021	1.70799923	2.25599957	2.81199932
3	70	37483.	2632.	0.05186732	0.00009411	0.00000019	1.69199944	2.24199963	2.79799938

Ob/Gyn

I	IA	Y	HB	G0(1)	G0(2)	G0(3)	G1(1)	G1(2)	G1(3)
4	30	56061.	2988.	0.07466346	0.00012318	0.00000023	1.73199940	2.27400017	2.82199955
4	35	61362.	2901.	0.08542395	0.00014408	0.00000027	1.74800014	2.29199982	2.84399998
4	40	64835.	2866.	0.09191728	0.00015645	0.00000030	1.75799942	2.30200005	2.85400009
4	45	65964.	2859.	0.09385735	0.00016005	0.00000031	1.75999928	2.30599976	2.85599995
4	50	64462.	2858.	0.09176975	0.00015653	0.00000030	1.75799942	2.30200005	2.85400009
4	55	60354.	2841.	0.08569651	0.00014854	0.00000029	1.75199985	2.29599953	2.84799957
4	60	54006.	2786.	0.07985103	0.00013880	0.00000027	1.74199953	2.28800011	2.84200001
4	65	46070.	2677.	0.07235128	0.00012962	0.00000026	1.73199940	2.27999973	2.83599949
4	[illegible]	37372.	2499.	0.06507373	0.00012276	0.00000026	1.71999931	2.27400017	2.83399963

*IA = Age
Y = Annual Earnings
HB = Annual Hours

Pediatric Surgery

Table 9.1

I	IA	Y	HB	G0(1)	G0(2)	G0(3)	G1(1)	G1(2)	G1(3)
5	30	39025.	3083.	0.02738031	0.00004412	0.00000008	1.61599923	2.15199947	2.69799995
5	35	43126.	2944.	0.03242853	0.00005410	0.00000010	1.63599965	2.17599964	2.72799998
5	[illegible]	46160.	2834.	0.03579257	0.00006263	0.00000013	1.64799970	2.18999958	2.73999977
5	45	47761.	2868.	0.03734943	0.00006354	0.00000012	1.65199947	2.19600010	2.74599934
5	50	47675.	2863.	0.03738105	0.00006368	0.00000012	1.65199947	2.19600010	2.74599934
5	55	45823.	2838.	0.03640372	0.00006242	0.00000012	1.64999963	2.19199944	2.74399948
5	60	42324.	2763.	0.03499573	0.00006122	0.00000013	1.64599991	2.18999959	2.74399948
5	65	37493.	2614.	0.03369067	0.00006144	0.00000013	1.64199924	2.18999959	2.74599934
5	70	31792.	2377.	0.03295194	0.00006454	0.00000014	1.63999939	2.19600010	2.75799942

Child Psy/Psy

I	IA	Y	HB	G0(1)	G0(2)	G0(3)	G1(1)	G1(2)	G1(3)
6	30	41990.	2522.	0.13484263	0.00025257	0.00000053	1.80799961	2.36199951	2.92199993
6	35	45129.	2483.	0.14834619	0.00028113	0.00000060	1.81999959	2.37399960	2.93599987
6	40	47877.	2492.	0.15655768	0.00029591	0.00000063	1.82599926	2.38000011	2.94199944
6	45	49774.	2519.	0.16018951	0.00030038	0.00000063	1.82800007	2.38199997	2.94399929
6	50	50341.	2533.	0.16050829	0.00029985	0.00000063	1.82800007	2.33199997	2.94199944
6	55	49172.	2506.	0.15947324	0.00030018	0.00000064	1.82800007	2.33199997	2.94399929
6	60	46050.	2408.	0.15849245	0.00030734	0.00000067	1.82800007	2.38599963	2.94999981
6	65	41048.	2223.	0.15934628	0.00032816	0.00000079	1.83199978	2.39599991	2.96399975
6	70	34573.	1946.	0.16379464	0.00037264	0.00000095	1.84200001	2.41399956	2.99399948

lergy/Dermatology

I	IA	Y	HB	G0(1)	G0(2)	G0(3)	G1(1)	G1(2)	G1(3)
7	30	44587.	2405.	0.06217647	0.00012069	0.00000026	1.71599960	2.27199936	2.83399963
7	35	47849.	2362.	0.06855702	0.00013489	0.00000030	1.72799969	2.28599930	2.84999943
7	40	49925.	2334.	0.07283741	0.00014461	0.00000032	1.73600006	2.29399967	2.85999965
7	45	50609.	2313.	0.07484591	0.00014961	0.00000034	1.73999977	2.29799938	2.86399937
7	50	49804.	2292.	0.07466608	0.00015027	0.00000034	1.73999977	2.29799938	2.86600018
7	55	47547.	2264.	0.07258639	0.00014742	0.00000034	1.73600006	2.29599953	2.86399937
7	60	44002.	2224.	0.06902289	0.00014209	0.00000033	1.73199940	2.29199982	2.85999966
7	65	39445.	2164.	0.06444228	0.00013539	0.00000032	1.72399999	2.28599930	2.85599995
7	70	34226.	2081.	0.05929554	0.00012828	0.00000031	1.71399975	2.27999973	2.85400009

Cardio/Gastro/Uro

I	IA	Y	HB	G0(1)	G0(2)	G0(3)	G1(1)	G1(2)	G1(3)
8	30	42124.	3359.	0.0	0.0	0.0	0.0	0.0	0.0
8	35	53511.	2969.	0.0	0.0	0.0	0.0	0.0	0.0
8	40	63664.	2829.	0.0	0.0	0.0	0.0	0.0	0.0
8	45	71210.	2831.	0.0	0.0	0.0	0.0	0.0	0.0
8	50	75174.	2896.	0.0	0.0	0.0	0.0	0.0	0.0
8	55	75184.	2952.	0.0	0.0	0.0	0.0	0.0	0.0
8	60	71515.	2920.	0.0	0.0	0.0	0.0	0.0	0.0
8	[illegible]	64944.	2730.	0.0	0.0	0.0	0.0	0.0	0.0
8	70	55523.	2350.	0.0	0.0	0.0	0.0	0.0	0.0

Neuro Surgery/Ortho Surgery

Table 9.1 (cont.)

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 I IA          Y        HB       G0(1)       G0(2)       G0(3)       G1(1)       G1(2)       G1(3)
 9 30     75215.     2511.0.065687950.000123460.000000261.722000122.274000172.83399953
 9 35     71653.     2838.0.052083770.000089390.000000171.691999442.236000002.79000011
 9 40     67868.     3011.0.045130850.000074020.000000141.673999792.213999752.75999928
 9 45     64013.     3032.0.042137820.000068790.000000131.665999412.203999522.75199995
 9 50     60231.     2927.0.041798990.000070030.000000131.665999412.205999372.75599957
 9 55     56636.     2738.0.043433510.000076500.000000151.679000082.215999632.75999950
 9 60     53312.     2509.0.046614290.000087660.000000191.682000192.233999252.79199982
 9 65     50326.     2275.0.050946990.000103090.000000231.693999292.251999852.81999969
 9 70     47724.     2064.0.055910550.000121710.000000301.707999232.274000172.84799957
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Opth/Otolar

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 I IA          Y        HB       G0(1)       G0(2)       G0(3)       G1(1)       G1(2)       G1(3)
10 30     47674.     2278.0.141355340.000285820.000000651.815999992.377999312.94600010
10 35     54540.     2490.0.141507510.000267660.000000571.814000132.368000032.92999935
10 40     58800.     2616.0.141610090.000258060.000000531.811999322.363999372.92199993
10 45     59316.     2650.0.141292210.000255000.000000521.809999472.361999512.91800022
10 50     57487.     2595.0.140188810.000257070.000000531.809999472.361999512.92199993
10 55     52262.     2461.0.137956620.000263200.000000551.809999472.366000182.92799950
10 60     44998.     2268.0.134295890.000272440.000000621.809999472.371999742.93999958
10 65     36740.     2035.0.128987610.000283810.000000701.809999472.377999312.95399952
10 70     28481.     1783.0.121912840.000296180.000000811.807999512.385999582.97200012
READY
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Table 9.2-1

General/Family Practice

	Years since med. school graduation	$\bar{Y}_{Nja}(\bar{H}ja)$	$\bar{Y}_{Nja}(\bar{H}ja)$	$\bar{Y}_{Nia}(\bar{H}ja)$	$\bar{Y}_{Nja}\frac{\bar{H}ia}{\bar{H}ja}$	$\bar{Y}_{Nia}\frac{\bar{H}ja}{\bar{H}ia}$	Columns 6-11: $\bar{Y}_{Nia}(\bar{H}jla)$ for:						$\bar{Y}_{Nia}(\bar{H}ia)$	Columns 13-18: $\bar{Y}_{Njla}(\bar{H}jla)$ for:					
							G0(1)	G0(2)	G0(3)	G1(1)	G1(2)	G1(3)		G0(1)	G0(2)	G0(3)	G1(1)	G1(2)	G1(3)
Earnings	5	44646.	44647.	44647.	44646.	44646.	44645.	44645.	44434.	44599.	44668.	44679.	44646.	44646.	44646.	44441.	44600.	44668.	44680.
Wage		3.01	3.01	3.01	13.00	13.00	3.01	3.01	3.06	3.02	3.01	3.00	3.01	3.01	3.01	3.06	3.02	3.01	3.00
Hours		3433.											3433.	3433.	3433.	3365.	3418.	3440.	3444.
	10	48407.	48408.	48408.	48407.	48407.	48406.	48406.	48364.	48439.	48375.	48388.	48407.	48407.	48407.	48365.	48441.	48377.	48389.
		3.55	3.55	3.55	15.33	15.33	3.55	3.55	3.56	3.54	3.56	3.55	3.55	3.55	3.55	3.56	3.54	3.56	3.55
		3157.											3157.	3157.	3157.	3145.	3166.	3148.	3152.
	15	50991.	50989.	50989.	50991.	50991.	50993.	50992.	51064.	51054.	51029.	50988.	50991.	50991.	50991.	51063.	51052.	51028.	50986.
		3.91	3.91	3.91	16.87	16.87	3.90	3.90	3.89	3.89	3.90	3.91	3.91	3.90	3.90	3.89	3.89	3.90	3.91
		3023.											3023.	3023.	3023.	3042.	3039.	3033.	3022.
	20	52000.	52002.	52002.	52000.	52000.	51998.	51998.	52086.	52041.	51982.	52000.	52000.	52001.	52000.	52089.	52044.	51985.	52003.
		4.05	4.05	4.05	17.50	17.50	4.05	4.05	4.03	4.04	4.06	4.05	4.05	4.05	4.05	4.03	4.04	4.06	4.05
		2971.											2971.	2971.	2970.	2993.	2981.	2967.	2971.
	25	51157.	51156.	51156.	51157.	51157.	51159.	51158.	51271.	51171.	51145.	51181.	51157.	51157.	51157.	51271.	51170.	51144.	51180.
		4.02	4.02	4.02	17.35	17.35	4.02	4.02	3.99	4.01	4.02	4.01	4.02	4.02	4.02	3.99	4.01	4.02	4.01
		2948.											2948.	2948.	2948.	2977.	2951.	2945.	2954.
	30	48380.	48378.	48378.	48380.	48380.	48382.	48382.	48416.	48391.	48402.	48385.	48380.	48380.	48379.	48414.	48389.	48400.	48383.
		3.85	3.85	3.85	16.62	16.62	3.85	3.85	3.84	3.84	3.84	3.85	3.85	3.85	3.85	3.84	3.84	3.84	3.85
		2911.											2911.	2911.	2911.	2920.	2914.	2917.	2912.
	35	43826.	43826.	43826.	43826.	43826.	43826.	43826.	43857.	43769.	43800.	43799.	43826.	43826.	43826.	43858.	43769.	43800.	43799.
		3.60	3.60	3.60	15.56	15.56	3.60	3.60	3.59	3.62	3.61	3.61	3.60	3.60	3.60	3.59	3.62	3.61	3.61
		2817.											2817.	2817.	2817.	2826.	2801.	2810.	2810.
	40	37894.	37895.	37895.	37894.	37894.	37894.	37894.	37909.	37867.	37903.	37913.	37894.	37895.	37895.	37910.	37868.	37904.	37914.
		3.34	3.34	3.34	14.41	14.41	3.34	3.34	3.33	3.34	3.33	3.33	3.34	3.34	3.34	3.33	3.34	3.33	3.33
		2630.											2630.	2630.	2630.	2634.	2622.	2633.	2636.
	45	31165.	31164.	31164.	31165.	31165.	31166.	31166.	31157.	31168.	31190.	31155.	31165.	31165.	31165.	31155.	31166.	31189.	31154.
		3.09	3.09	3.09	13.36	13.36	3.09	3.09	3.10	3.09	3.08	3.10	3.09	3.09	3.09	3.10	3.09	3.08	3.10
		2333.											2333.	2333.	2333.	2330.	2334.	2341.	2330.
Present value with: r=.05		716.8	716.8	716.8	716.8	716.8	716.7	716.7	717.0	716.8	716.8	716.7	716.8	716.8	716.8	717.0	716.8	716.8	716.7
r=.1		374.9	374.9	374.9	374.9	374.9	374.9	374.9	374.9	374.9	375.0	374.9	374.9	374.9	374.9	374.9	374.9	375.0	374.9

Table 9.2-2

General Surgery

	Years since med school graduation	$\bar{Y}_{Nja}(\bar{H}_{ja})$	$\bar{Y}_{Nja}(\bar{H}_{ja})$	$\bar{Y}_{Nia}(\bar{H}_{ja})$	$\bar{Y}_{Nja}\frac{\bar{H}_{ia}}{\bar{H}_{ja}}$	$\bar{Y}_{Nia}\frac{\bar{H}_{ja}}{\bar{H}_{ia}}$	Columns 6-11: $\bar{Y}_{Nia}(\bar{H}_{jia})$ for:						$\bar{Y}_{Nia}(\bar{H}_{ia})$	Columns 13-18: $\bar{Y}_{Njia}(\bar{H}_{jia})$ for:					
							G0(1)	G0(2)	G0(3)	G1(1)	G1(2)	G1(3)		G0(1)	G0(2)	G0(3)	G1(1)	G1(2)	G1(3)
Earnings	5	44646.	42916.	49231.	37636.	57355.	50899.	50845.	50156.	50950.	51032.	50390.	48350.	46780.	46317.	45385.	46780.	46583.	45698.
Wage		3.01	3.43	1.52	13.00	16.71	2.13	2.67	2.85	2.20	2.62	2.79	1.77	2.58	2.67	2.85	2.58	2.62	2.79
Hours		3433.											2894.	4200.	4023.	3685.	4200.	4124.	3796.
	10	48407.	47762.	53933.	45678.	56806.	56149.	56391.	55657.	56184.	56480.	55859.	53603.	51715.	51569.	50595.	51715.	51715.	50834.
		3.55	3.71	1.81	15.33	17.99	2.26	2.88	3.07	2.32	2.81	3.02	1.90	2.85	2.88	3.07	2.85	2.85	3.02
		3157.											2979.	4200.	4149.	3821.	4200.	4200.	3899.
	15	50991.	51044.	57818.	51227.	57579.	60398.	60764.	60061.	60451.	60709.	60249.	57846.	55023.	55023.	54110.	55023.	55023.	54313.
		3.91	3.89	2.02	16.87	19.05	2.37	3.02	3.21	2.45	2.92	3.17	2.01	3.03	3.03	3.21	3.03	3.03	3.17
		3023.											3037.	4200.	4200.	3907.	4200.	4200.	3971.
	20	52000.	52367.	60561.	53593.	58948.	63350.	63697.	63029.	63400.	63665.	63130.	60754.	56342.	56328.	55517.	56342.	56342.	55558.
		4.05	3.96	2.15	17.50	19.84	2.46	3.11	3.26	2.54	3.02	3.25	2.10	3.11	3.11	3.26	3.11	3.11	3.25
		2971.											3062.	4200.	4196.	3941.	4200.	4200.	3953.
	25	51157.	51549.	61872.	52875.	60072.	64794.	64853.	63996.	64863.	64987.	64322.	62089.	55525.	55209.	54038.	55525.	55378.	54499.
		4.02	3.92	2.22	17.35	20.38	2.53	3.12	3.35	2.64	3.09	3.26	2.15	3.06	3.12	3.35	3.06	3.09	3.26
		2948.											3047.	4200.	4098.	3736.	4200.	4152.	3875.
	30	48380.	48667.	61561.	49643.	60158.	64631.	64162.	63535.	64684.	64282.	63730.	61729.	52663.	51816.	51027.	52663.	51969.	51268.
		3.85	3.77	2.23	16.62	20.67	2.59	3.06	3.22	2.68	3.03	3.17	2.18	2.90	3.06	3.22	2.90	3.03	3.17
		2911.											2987.	4200.	3916.	3665.	4200.	3966.	3740.
	35	43826.	44051.	59555.	44806.	58388.	62895.	61679.	61076.	62596.	61751.	61322.	59694.	48072.	46545.	45772.	47685.	46627.	46104.
		3.60	3.54	2.23	15.56	20.73	2.65	2.95	3.12	2.72	2.93	3.04	2.19	2.65	2.95	3.12	2.72	2.93	3.04
		2817.											2880.	4200.	3654.	3398.	4056.	3681.	3506.
	40	37894.	38207.	55927.	39263.	54180.	58526.	57616.	57156.	58336.	57684.	57320.	56137.	41098.	39999.	39429.	40874.	40082.	39638.
		3.34	3.25	2.25	14.41	20.60	2.55	2.79	2.92	2.59	2.77	2.87	2.18	2.55	2.79	2.92	2.59	2.77	2.87
		2630.											2725.	3734.	3322.	3122.	3647.	3351.	3194.
	45	31165.	31742.	50898.	33743.	47406.	52892.	52300.	52072.	52766.	52314.	52103.	51328.	33553.	32869.	32612.	33412.	32881.	32639.
		3.09	2.91	2.31	13.36	20.32	2.42	2.59	2.66	2.45	2.59	2.65	2.15	2.42	2.59	2.66	2.45	2.59	2.65
		2333.											2526.	3210.	2937.	2839.	3152.	2941.	2849.
Present value with:																			
r=.05		716.8	709.8	766.6	688.9	781.6	810.2	808.3	796.7	810.2	809.7	800.5	765.0	768.0	762.6	748.6	767.7	764.5	752.9
r=.1		374.9	368.6	360.7	349.4	375.7	384.2	383.2	376.8	384.2	384.1	378.8	359.0	399.4	396.9	389.5	399.4	398.1	391.8

Table 9.2-3 Internal Medicine

	Years since med school graduation	$\overline{Y}_{Nja}(\overline{Hja})$	$\overline{Y}_{Nja}(\overline{Hja})$	$\overline{Y}_{Nia}(\overline{Hja})$	$\overline{Y}_{Nja}\frac{\overline{H}ia}{\overline{H}ja}$	$\overline{Y}_{Nia}\frac{\overline{H}ja}{\overline{H}ia}$	Columns 6-11: $\overline{Y}_{Nia}(\overline{H}jla)$ for:						$\overline{Y}_{Nia}(\overline{Hia})$	Columns 13-18: $\overline{Y}_{Njla}(\overline{H}jla)$ for:					
							G0(1)	G0(2)	G0(3)	G1(1)	G1(2)	G1(3)		G0(1)	G0(2)	G0(3)	G1(1)	G1(2)	G1(3)
Earnings	5	44646.	43245.	54846.	38898.	60565.	49125.	50450.	51187.	49559.	50462.	50953.	52767.	40274.	41353.	41938.	40637.	41360.	41761.
Wage		3.01	3.35	4.48	13.00	17.64	4.24	3.88	3.71	4.11	3.88	3.76	4.94	4.24	3.88	3.71	4.11	3.88	3.76
Hours		3433.											2991.	2199.	2465.	2620.	2286.	2467.	2572.
	10	48407.	47906.	58936.	46276.	60878.	54219.	55667.	56277.	54854.	55638.	56156.	58198.	44652.	45835.	46342.	45160.	45816.	46242.
		3.55	3.67	5.23	15.33	19.28	4.64	4.26	4.10	4.47	4.26	4.13	5.40	4.64	4.26	4.10	4.47	4.26	4.13
		3157.											3018.	2227.	2493.	2615.	2339.	2489.	2591.
	15	50991.	50935.	61567.	50755.	61774.	57340.	58850.	59576.	57926.	58916.	59449.	61488.	47530.	48768.	49361.	48013.	48815.	49255.
		3.91	3.92	5.71	16.87	20.43	4.93	4.53	4.35	4.77	4.51	4.38	5.73	4.93	4.53	4.35	4.77	4.51	4.38
		3023.											3009.	2232.	2494.	2627.	2331.	2504.	2603.
	20	52000.	52002.	62269.	52000.	62271.	58142.	59647.	60395.	58737.	59644.	60236.	62271.	48599.	49837.	50448.	49091.	49839.	50320.
		4.05	4.05	5.87	17.50	20.96	5.07	4.67	4.48	4.91	4.67	4.52	5.87	5.07	4.67	4.48	4.91	4.67	4.52
		2971.											2971.	2218.	2473.	2606.	2317.	2473.	2578.
	25	51157.	51011.	60696.	50532.	61238.	56565.	57996.	58628.	57190.	57992.	58522.	60490.	47758.	48942.	49471.	48270.	48943.	49381.
		4.02	4.06	5.77	17.35	20.77	5.05	4.65	4.49	4.87	4.65	4.52	5.82	5.05	4.65	4.49	4.87	4.65	4.52
		2948.											2912.	2191.	2435.	2551.	2294.	2435.	2531.
	30	48380.	48106.	56788.	47217.	57790.	52828.	54129.	54731.	53296.	54149.	54611.	56400.	45128.	46212.	46714.	45526.	46229.	46615.
		3.85	3.92	5.47	16.62	19.85	4.85	4.48	4.32	4.71	4.47	4.35	5.56	4.85	4.48	4.32	4.71	4.47	4.35
		2911.											2841.	2156.	2388.	2503.	2239.	2392.	2480.
	35	43826.	43630.	50780.	42986.	51493.	47405.	48536.	49143.	47845.	48565.	48956.	50506.	41027.	41976.	42475.	41396.	41998.	42329.
		3.60	3.66	5.05	15.56	18.28	4.48	4.16	4.00	4.35	4.15	4.04	5.12	4.48	4.16	4.00	4.35	4.15	4.04
		2817.											2763.	2118.	2338.	2461.	2202.	2344.	2424.
	40	37894.	38083.	43208.	38715.	42547.	40891.	41833.	42255.	41237.	41829.	42152.	43469.	35903.	36698.	37057.	36196.	36696.	36973.
		3.34	3.28	4.60	14.41	16.18	3.99	3.71	3.59	3.88	3.71	3.62	4.53	3.99	3.71	3.59	3.88	3.71	3.62
		2630.											2687.	2083.	2290.	2388.	2157.	2289.	2365.
	45	31165.	32009.	34835.	34985.	32052.	33929.	34678.	34972.	34231.	34676.	34921.	35981.	30260.	30898.	31155.	30512.	30895.	31109.
		3.09	2.83	4.18	13.36	13.74	3.41	3.18	3.10	3.32	3.18	3.11	3.85	3.41	3.18	3.10	3.32	3.18	3.11
		2333.											2619.	2054.	2248.	2330.	2129.	2247.	2315.
Present value with: r=.05		716.8	708.9	828.6	684.5	853.4	770.0	788.2	796.4	777.2	788.4	795.0	819.4	662.2	679.2	687.0	668.8	679.3	685.5
r=.1		374.9	369.1	418.2	350.9	436.0	388.3	397.0	400.9	391.7	397.1	400.2	411.6	344.3	353.3	357.5	347.8	353.4	356.7

Table 9.2-4 Obstetrics/Gynecology

	Years since med. school graduation	$\bar{Y}_{Nja}(\bar{H}_{ja})$	$\bar{Y}_{Nja}(\bar{H}_{ja})$	$\bar{Y}_{Nia}(\bar{H}_{ja})$	$\bar{Y}_{Nja}\frac{\bar{H}_{ia}}{\bar{H}_{ja}}$	$\bar{Y}_{Nia}\frac{\bar{H}_{ja}}{\bar{H}_{ia}}$	Columns 6-11: $\bar{Y}_{Nia}(\bar{H}_{jla})$ for:						$\bar{Y}_{Nia}(\bar{H}_{ia})$	Columns 13-18: $\bar{Y}_{Njla}(\bar{H}_{jla})$ for:					
							G0(1)	G0(2)	G0(3)	G1(1)	G1(2)	G1(3)		G0(1)	G0(2)	G0(3)	G1(1)	G1(2)	G1(3)
Earnings	5	44646.	43157.	60043.	38560.	66273.	50731.	53071.	54142.	51726.	53144.	53934.	57238.	38502.	40169.	40941.	39207.	40219.	40794.
Wage		3.01	3.37	5.71	13.00	19.30	4.92	4.28	4.01	4.63	4.26	4.06	6.30	4.92	4.28	4.01	4.63	4.26	4.06
Hours		3433.											2965.	1811.	2175.	2361.	1959.	2186.	2325.
	10	48407.	47428.	64040.	44313.	67971.	55236.	57751.	58941.	56253.	57774.	58743.	62222.	42398.	44202.	45057.	43145.	44233.	44916.
		3.55	3.80	6.62	15.33	21.53	5.51	4.80	4.50	5.20	4.79	4.55	7.02	5.51	4.80	4.50	5.20	4.79	4.55
		3157.											2890.	1781.	2132.	2316.	1920.	2138.	2285.
	15	50991.	50351.	66432.	48292.	68909.	58029.	60633.	61919.	59278.	60698.	61737.	65262.	45109.	46989.	47910.	45996.	47047.	47777.
		3.91	4.07	7.17	16.87	22.79	5.87	5.12	4.80	5.50	5.10	4.85	7.44	5.87	5.12	4.80	5.50	5.10	4.85
		3023.											2863.	1781.	2124.	2310.	1937.	2135.	2282.
	20	52000.	51542.	66711.	50040.	68459.	58694.	61282.	62417.	59876.	61470.	62357.	65878.	46293.	48177.	49021.	47152.	48302.	48955.
		4.05	4.17	7.32	17.50	23.04	5.96	5.22	4.93	5.61	5.18	4.95	7.52	5.96	5.22	4.93	5.61	5.18	4.95
		2971.											2859.	1798.	2136.	2302.	1946.	2160.	2289.
	25	51157.	50782.	64504.	49561.	65899.	57021.	59481.	60587.	58185.	59537.	60407.	63842.	45750.	47559.	48384.	46595.	47610.	48252.
		4.02	4.12	7.14	17.35	22.35	5.82	5.12	4.83	5.48	5.10	4.88	7.29	5.82	5.12	4.83	5.48	5.10	4.88
		2948.											2856.	1820.	2152.	2317.	1969.	2162.	2290.
	30	48380.	48075.	59771.	47084.	60878.	53074.	55304.	56427.	53998.	55435.	56234.	59247.	43470.	45128.	45952.	44167.	45217.	45813.
		3.85	3.93	6.70	16.62	20.91	5.49	4.85	4.56	5.21	4.81	4.61	6.82	5.49	4.85	4.56	5.21	4.81	4.61
		2911.											2833.	1834.	2156.	2331.	1964.	2174.	2301.
	35	43826.	43652.	52813.	43079.	53431.	47221.	49137.	50011.	48032.	49230.	49895.	52521.	39644.	41089.	41754.	40257.	41153.	41661.
		3.60	3.65	6.12	15.56	18.97	5.02	4.46	4.23	4.78	4.44	4.26	6.19	5.02	4.46	4.23	4.78	4.44	4.26
		2817.											2769.	1827.	2132.	2285.	1952.	2147.	2263.
	40	37894.	37951.	44272.	38139.	44079.	40062.	41618.	42351.	40650.	41694.	42192.	44364.	34647.	35839.	36401.	35105.	35891.	36285.
		3.34	3.32	5.49	14.41	16.76	4.49	4.01	3.81	4.30	4.00	3.85	5.47	4.49	4.01	3.81	4.30	4.00	3.85
		2630.											2647.	1786.	2067.	2211.	1890.	2080.	2180.
	45	31165.	31531.	35032.	32781.	33861.	32344.	33531.	34117.	32854.	33594.	34012.	35617.	28968.	29895.	30349.	29359.	29938.	30268.
		3.09	2.97	4.90	13.36	14.51	3.94	3.55	3.38	3.77	3.53	3.41	4.73	3.94	3.55	3.38	3.77	3.53	3.41
		2333.											2454.	1702.	1950.	2081.	1803.	1962.	2057.
Present value with: r=.05		716.8	704.6	841.4	666.2	879.0	743.6	773.1	786.6	756.7	774.3	784.8	824.1	632.1	658.1	670.2	643.4	659.1	668.5
r=.1		374.9	366.9	411.9	341.7	434.7	365.1	378.6	384.7	371.1	379.2	383.9	401.4	328.4	342.2	348.6	334.4	342.7	347.7

Table 9.2-6 Child Psychiatry/Psychiatry

	Years since med. school graduation	$\bar{Y}_{Nja}(\bar{H}ja)$	$\bar{Y}_{Nja}(\bar{H}ja)$	$\bar{Y}_{Nia}(\bar{H}ja)$	$\bar{Y}_{Nja}\frac{\bar{H}ia}{\bar{H}ja}$	$\bar{Y}_{Nia}\frac{\bar{H}ja}{\bar{H}ia}$	Columns 6-11: $\bar{Y}_{Nia}(\bar{H}jia)$ for:						$\bar{Y}_{Nia}(\bar{H}ia)$	Columns 13-18: $\bar{Y}_{Nja}(\bar{H}jia)$ for:					
							G0(1)	G0(2)	G0(3)	G1(1)	G1(2)	G1(3)		G0(1)	G0(2)	G0(3)	G1(1)	G1(2)	G1(3)
Earnings	5	44646.	41520.	51615.	32629.	58328.	30634.	34882.	36890.	32879.	35319.	36724.	42629.	34623.	37041.	38198.	35893.	37283.	38106.
Wage		3.01	3.83	9.17	13.00	16.99	7.00	5.60	5.05	6.21	5.48	5.09	10.37	7.00	5.60	5.05	6.21	5.48	5.09
Hours		3433.											2509.	1145.	1532.	1750.	1337.	1576.	1732.
	10	48407.	45786.	52949.	38057.	58159.	33049.	37543.	39655.	35582.	38008.	39553.	45724.	38374.	40976.	42216.	39811.	41247.	42150.
		3.55	4.27	10.23	15.33	18.42	7.68	6.17	5.59	6.79	6.04	5.62	11.24	7.68	6.17	5.59	6.79	6.04	5.62
		3157.											2482.	1157.	1537.	1748.	1357.	1581.	1736.
	15	50991.	48782.	54322.	42119.	58523.	34993.	39725.	42007.	37610.	40136.	41909.	48340.	40941.	43695.	45028.	42452.	43957.	44964.
		3.91	4.52	10.97	16.87	19.36	8.09	6.52	5.90	7.17	6.39	5.93	11.81	8.09	6.52	5.90	7.17	6.39	5.93
		3023.											2497.	1171.	1552.	1767.	1370.	1592.	1756.
	20	52000.	50076.	55246.	44176.	58866.	36137.	41052.	43444.	38829.	41594.	43180.	50009.	41966.	44812.	46199.	43521.	45126.	46073.
		4.05	4.59	11.35	17.50	19.81	8.26	6.64	6.00	7.32	6.49	6.06	12.09	8.26	6.64	6.00	7.32	6.49	6.06
		2971.											2524.	1177.	1562.	1782.	1377.	1610.	1761.
	25	51157.	49386.	55143.	43938.	58514.	36181.	41167.	43540.	38889.	41675.	43445.	50257.	41248.	44102.	45473.	42799.	44401.	45409.
		4.02	4.52	11.41	17.35	19.85	8.21	6.57	5.94	7.26	6.43	5.97	12.11	8.21	6.57	5.94	7.26	6.43	5.97
		2948.											2532.	1163.	1553.	1773.	1364.	1599.	1762.
	30	48380.	46672.	53542.	41433.	56874.	34878.	39770.	42100.	37491.	40348.	41996.	48707.	38801.	41557.	42882.	40283.	41874.	42818.
		3.85	4.33	11.22	16.62	19.54	8.00	6.37	5.74	7.07	6.21	5.77	11.92	8.00	6.37	5.74	7.07	6.21	5.77
		2911.											2493.	1123.	1510.	1729.	1320.	1560.	1718.
	35	43826.	42144.	50104.	37012.	53512.	32186.	36782.	39019.	34809.	37384.	38873.	45192.	34864.	37409.	38650.	36288.	37725.	38578.
		3.60	4.10	10.85	15.56	19.00	7.70	6.09	5.47	6.74	5.92	5.50	11.59	7.70	6.09	5.47	6.74	5.92	5.50
		2817.											2379.	1049.	1422.	1637.	1247.	1474.	1624.
	40	37894.	36260.	44757.	31324.	48211.	28254.	32352.	34295.	30473.	32834.	34211.	39852.	29864.	32098.	33171.	31082.	32365.	33131.
		3.34	3.86	10.38	14.41	18.33	7.35	5.79	5.19	6.44	5.63	5.21	11.19	7.35	5.79	5.19	6.44	5.63	5.21
		2630.											2174.	940.	1284.	1480.	1117.	1331.	1472.
	45	31165.	29648.	37810.	25127.	41127.	23431.	26866.	28528.	25347.	27359.	28544.	33159.	24341.	26192.	27093.	25378.	26454.	27099.
		3.09	3.65	9.89	13.36	17.63	7.02	5.51	4.92	6.11	5.33	4.92	10.76	7.02	5.51	4.92	6.11	5.33	4.92
		2333.											1881.	802.	1101.	1274.	961.	1150.	1276.
Present value with:																			
r=.05		716.8	681.0	713.0	575.5	773.5	461.1	520.8	549.2	493.5	527.1	547.6	628.1	568.9	608.2	627.2	590.0	612.3	626.0
r=.1		374.9	354.3	345.5	294.2	377.5	224.5	252.2	265.2	239.5	255.0	264.4	301.1	296.1	316.5	326.4	307.0	318.6	325.7

Table 9.2-7 **Allergy/Dermatology**

	Years since med. school graduation	$\bar{Y}_{Nja}(Hja)$	$\bar{Y}_{Nja}(\bar{H}ja)$	$\bar{Y}_{Nia}(\bar{H}ja)$	$\bar{Y}_{Nja}\frac{\bar{H}ia}{\bar{H}ja}$	$\bar{Y}_{Nia}\frac{\bar{H}ja}{\bar{H}ia}$	Columns 6-11: $\bar{Y}_{Nia}(\bar{H}j\vert a)$ for: G0(1)	G0(2)	G0(3)	G1(1)	G1(2)	G1(3)	$\bar{Y}_{Nia}(\bar{H}ia)$	Columns 13-18: $\bar{Y}_{Nj\vert a}(\bar{H}j\vert a)$ for: G0(1)	G0(2)	G0(3)	G1(1)	G1(2)	G1(3)
Earnings	5	44646.	41076.	49531.	31147.	64963.	44021.	44500.	44740.	44160.	44467.	44699.	45321.	39879.	40320.	40540.	40011.	40293.	40502.
Wage		3.01	3.97	3.56	13.00	18.92	4.38	4.22	4.15	4.33	4.23	4.16	4.67	4.38	4.22	4.15	4.33	4.23	4.16
Hours		3433.											2395.	2108.	2210.	2263.	2138.	2204.	2254.
	10	48407.	45237.	51991.	36125.	64811.	47226.	47646.	47901.	47425.	47639.	47820.	48367.	44169.	44562.	44797.	44354.	44557.	44724.
		3.55	4.45	4.06	15.33	20.53	4.81	4.67	4.59	4.75	4.67	4.62	5.07	4.81	4.67	4.59	4.75	4.67	4.62
		3157.											2356.	2125.	2208.	2259.	2164.	2207.	2243.
	15	50991.	48002.	53511.	39285.	65130.	49190.	49556.	49677.	49287.	49530.	49728.	50178.	47066.	47412.	47530.	47161.	47390.	47574.
		3.91	4.77	4.37	16.87	21.54	5.09	4.97	4.93	5.06	4.98	4.92	5.32	5.09	4.97	4.93	5.06	4.98	4.92
		3023.											2329.	2139.	2208.	2232.	2158.	2203.	2241.
	20	52000.	49054.	53813.	40413.	65066.	49691.	50015.	50136.	49824.	50057.	50174.	50568.	48218.	48527.	48644.	48345.	48566.	48678.
		4.05	4.92	4.47	17.50	21.90	5.21	5.10	5.06	5.16	5.08	5.05	5.40	5.21	5.10	5.06	5.16	5.08	5.05
		2971.											2309.	2144.	2204.	2227.	2168.	2211.	2233.
	25	51157.	48236.	52662.	39687.	63762.	48654.	48954.	49093.	48732.	48993.	49053.	49465.	47460.	47747.	47880.	47537.	47783.	47842.
		4.02	4.88	4.41	17.35	21.63	5.15	5.05	5.00	5.13	5.04	5.02	5.34	5.15	5.05	5.00	5.13	5.04	5.02
		2948.											2287.	2132.	2189.	2215.	2147.	2196.	2208.
	30	48380.	45615.	49972.	37527.	60506.	46133.	46428.	46508.	46234.	46430.	46529.	46933.	44851.	45133.	45212.	44949.	45135.	45230.
		3.85	4.68	4.24	16.62	20.79	4.95	4.84	4.82	4.91	4.84	4.81	5.13	4.95	4.84	4.82	4.91	4.84	4.81
		2911.											2258.	2099.	2157.	2173.	2119.	2157.	2177.
	35	43826.	41449.	45806.	34445.	54916.	42336.	42640.	42748.	42440.	42611.	42765.	43161.	40666.	40955.	41059.	40766.	40929.	41073.
		3.60	4.33	4.01	15.56	19.49	4.62	4.51	4.47	4.58	4.52	4.47	4.81	4.62	4.51	4.47	4.58	4.52	4.47
		2817.											2214.	2039.	2102.	2125.	2061.	2097.	2129.
	40	37894.	36167.	40403.	30978.	47024.	37574.	37894.	38023.	37689.	37868.	38024.	38442.	35352.	35653.	35775.	35461.	35631.	35775.
		3.34	3.89	3.79	14.41	17.88	4.20	4.08	4.04	4.16	4.09	4.04	4.41	4.20	4.08	4.04	4.16	4.09	4.04
		2630.											2150.	1948.	2021.	2051.	1974.	2016.	2051.
	45	31165.	30285.	34163.	27545.	37492.	32229.	32563.	32727.	32378.	32587.	32707.	33137.	29446.	29755.	29906.	29582.	29776.	29887.
		3.09	3.40	3.61	13.36	16.07	3.73	3.61	3.55	3.68	3.60	3.55	3.97	3.73	3.61	3.55	3.68	3.60	3.55
		2333.											2062.	1826.	1910.	1953.	1863.	1916.	1947.
Present value with: r=.05		716.8	670.7	689.8	538.7	849.3	640.9	642.6	643.3	641.7	642.7	643.3	644.5	656.0	661.4	663.9	658.2	661.6	663.6
r=.1		374.9	349.3	336.0	276.5	418.0	314.3	314.1	313.9	314.3	314.1	3¬4.0	312.8	341.0	344.1	345.5	342.3	344.1	345.3

Table 9.2-9 Neurological Surgery/Orthopedic Surgery

	Years since med. school graduation	$\overline{Y}_{Nja}(\overline{H}ja)$	$\overline{Y}_{Nja}(\overline{H}ja)$	$\overline{Y}_{Nia}(\overline{H}ja)$	$\overline{Y}_{Nja}\frac{\overline{H}ia}{\overline{H}ja}$	$\overline{Y}_{Nia}\frac{\overline{H}ja}{\overline{H}ia}$	Columns 6-11: $\overline{Y}_{Nia}(\overline{H}j\|a)$ for:						$\overline{Y}_{Nia}(\overline{H}ia)$	Columns 13-18: $\overline{Y}_{Nj\|a}(\overline{H}j\|a)$ for:					
							G0(1)	G0(2)	G0(3)	G1(1)	G1(2)	G1(3)		G0(1)	G0(2)	G0(3)	G1(1)	G1(2)	G1(3)
Earnings	5	44646.	41816.	0.	33644.	0.	6180.	4187.	3160.	5443.	4153.	3353.	0.	40039.	40691.	40941.	40321.	40667.	40913.
Wage		3.01	3.74	3.75	13.00	28.81	4.32	4.10	4.01	4.22	4.10	4.02	4.75	4.32	4.10	4.01	4.22	4.10	4.02
Hours		3433.											2587.	2145.	2300.	2361.	2211.	2294.	2354.
	10	48407.	47409.	71973.	44236.	77599.	70356.	70563.	70715.	70488.	70554.	70644.	70913.	46869.	47069.	47215.	46995.	47061.	47148.
		3.55	3.80	3.76	15.33	24.58	3.95	3.90	3.86	3.92	3.90	3.87	4.05	3.95	3.90	3.86	3.92	3.90	3.87
		3157.											2885.	2746.	2797.	2834.	2778.	2795.	2817.
	15	50991.	51005.	67083.	51058.	67008.	67691.	67470.	67457.	67557.	67511.	67383.	67097.	51619.	51390.	51380.	51478.	51434.	51300.
		3.91	3.90	3.66	16.87	22.17	3.75	3.80	3.81	3.78	3.79	3.83	3.65	3.75	3.80	3.81	3.78	3.79	3.83
		3023.											3027.	3188.	3127.	3124.	3150.	3138.	3103.
	20	52000.	52200.	63078.	52858.	62221.	64572.	64075.	63735.	64462.	64111.	63889.	63247.	53625.	53090.	52716.	53509.	53131.	52888.
		4.05	4.00	3.50	17.50	20.94	3.66	3.78	3.87	3.69	3.77	3.83	3.45	3.66	3.78	3.87	3.69	3.77	3.83
		2971.											3020.	3393.	3249.	3151.	3361.	3260.	3196.
	25	51157.	50937.	59675.	50220.	60604.	61089.	60490.	60347.	60887.	60520.	60291.	59494.	52684.	52028.	51888.	52461.	52062.	51811.
		4.02	4.07	3.34	17.35	20.56	3.64	3.80	3.83	3.70	3.79	3.85	3.39	3.64	3.80	3.83	3.70	3.79	3.85
		2948.											2894.	3348.	3171.	3135.	3287.	3180.	3114.
	30	48380.	47518.	56665.	44774.	60453.	57375.	56839.	56535.	57234.	56844.	56671.	55947.	49075.	48491.	48154.	48925.	48495.	48309.
		3.85	4.08	3.21	16.62	20.77	3.67	3.82	3.91	3.71	3.82	3.87	3.42	3.67	3.82	3.91	3.71	3.82	3.87
		2911.											2694.	3097.	2941.	2853.	3056.	2942.	2893.
	35	43826.	42480.	53871.	38303.	60283.	53602.	53259.	53169.	53455.	53292.	53133.	52686.	43455.	43089.	42999.	43296.	43127.	42955.
		3.60	3.99	3.15	15.56	21.40	3.71	3.81	3.84	3.75	3.80	3.85	3.53	3.71	3.81	3.84	3.75	3.80	3.85
		2817.											2462.	2715.	2618.	2595.	2673.	2628.	2583.
	40	37894.	36478.	51143.	32145.	58676.	49964.	49893.	49816.	49964.	49921.	49841.	49774.	36671.	36599.	36521.	36672.	36628.	36546.
		3.34	3.79	3.21	14.41	22.31	3.72	3.74	3.77	3.72	3.73	3.76	3.68	3.72	3.74	3.77	3.72	3.73	3.76
		2630.											2231.	2282.	2263.	2242.	2283.	2271.	2249.
	45	31165.	30162.	48363.	27064.	54413.	46626.	46859.	46983.	46720.	46844.	46963.	47253.	29569.	29789.	29986.	29657.	29776.	29887.
		3.09	3.45	3.42	13.36	23.32	3.68	3.59	3.55	3.65	3.60	3.55	3.84	3.68	3.59	3.55	3.65	3.60	3.55
		2333.											2026.	1859.	1920.	1953.	1884.	1916.	1947.
Present value with: r=.05		716.8	699.3	836.2	647.9	891.8	844.8	838.6	835.4	842.6	838.7	836.1	826.1	699.2	699.2	699.1	699.4	699.5	699.3
r=.1		374.9	363.1	404.1	328.7	435.4	410.6	406.7	404.7	409.1	406.7	405.1	398.5	359.2	360.6	361.2	359.8	360.8	361.2

Table 9.2-10 Opthamology/Otolaryngology

	Years since med. school graduation	$\bar{Y}_{Nja}(\bar{H}ja)$	$\bar{Y}_{Nja}(\bar{H}ja)$	$\bar{Y}_{Nia}(\bar{H}ja)$	$\bar{Y}_{Nja}\frac{\bar{H}ia}{\bar{H}ja}$	$\bar{Y}_{Nia}\frac{\bar{H}ja}{\bar{H}ia}$	Columns 6-11: $\bar{Y}_{Nla}(\bar{H}jla)$ for:						$\bar{Y}_{Nia}(\bar{H}ia)$	Columns 13-18: $\bar{Y}_{Njla}(\bar{H}jla)$ for:					
							G0(1)	G0(2)	G0(3)	G1(1)	G1(2)	G1(3)		G0(1)	G0(2)	G0(3)	G1(1)	G1(2)	G1(3)
Earnings	5	44646.	40799.	59398.	30250.	72630.	38671.	42414.	44196.	40657.	42749.	44086.	49210.	34469.	36698.	37767.	35650.	36909.	37702.
Wage		3.01	4.06	8.37	13.00	21.16	7.11	5.77	5.25	6.35	5.66	5.28	10.23	7.11	5.77	5.25	6.35	5.66	5.28
Hours		3433.											2326.	1123.	1472.	1666.	1299.	1509.	1654.
	10	48407.	45956.	62004.	38670.	69634.	43690.	47929.	49926.	45807.	48427.	49784.	55628.	38801.	41320.	42519.	40083.	41597.	42433.
		3.55	4.22	9.50	15.33	22.06	7.40	6.00	5.46	6.64	5.87	5.50	10.66	7.40	6.00	5.46	6.64	5.87	5.50
		3157.											2522.	1214.	1593.	1803.	1397.	1640.	1787.
	15	50991.	49376.	63394.	44379.	68105.	46610.	51106.	53335.	48909.	51583.	53115.	59274.	41750.	44435.	45756.	43134.	44708.	45634.
		3.91	4.34	10.14	16.87	22.53	7.58	6.17	5.59	6.80	6.04	5.64	10.89	7.58	6.17	5.59	6.80	6.04	5.64
		3023.											2631.	1275.	1668.	1894.	1468.	1713.	1872.
	20	52000.	50626.	63042.	46312.	66933.	47031.	51503.	53601.	49503.	51874.	53382.	59611.	42960.	45663.	46946.	44423.	45897.	46823.
		4.05	4.43	10.26	17.50	22.53	7.64	6.24	5.69	6.84	6.13	5.74	10.89	7.64	6.24	5.69	6.84	6.13	5.74
		2971.											2646.	1302.	1695.	1910.	1505.	1732.	1888.
	25	51157.	49574.	60494.	44667.	64882.	44917.	49092.	50997.	47218.	49421.	50981.	56651.	42296.	44866.	46063.	43685.	45083.	46024.
		4.02	4.46	9.92	17.35	22.01	7.55	6.21	5.69	6.78	6.11	5.71	10.64	7.55	6.21	5.69	6.78	6.11	5.71
		2948.											2574.	1296.	1673.	1874.	1491.	1708.	1867.
	30	48380.	46383.	55624.	40336.	61099.	40671.	44330.	46133.	42695.	44628.	46005.	50940.	39862.	42170.	43300.	41114.	42370.	43220.
		3.85	4.42	9.24	16.62	20.99	7.32	6.07	5.56	6.60	5.97	5.59	10.15	7.32	6.07	5.56	6.60	5.97	5.59
		2911.											2427.	1261.	1608.	1803.	1442.	1642.	1789.
	35	43826.	41492.	48648.	34600.	54962.	34957.	37969.	39350.	36601.	38205.	39357.	43392.	35978.	37935.	38847.	37031.	38104.	38833.
		3.60	4.32	8.35	15.56	19.51	6.93	5.82	5.38	6.30	5.73	5.38	9.43	6.93	5.82	5.38	6.30	5.73	5.38
		2817.											2224.	1201.	1510.	1673.	1361.	1539.	1671.
	40	37894.	35509.	40162.	28615.	46428.	28558.	30885.	31999.	29750.	31133.	31934.	35059.	31114.	32679.	33429.	31921.	32846.	33389.
		3.34	4.14	7.38	14.41	17.65	6.42	5.45	5.06	5.90	5.36	5.08	8.53	6.42	5.45	5.06	5.90	5.36	5.08
		2630.											1986.	1122.	1387.	1530.	1254.	1418.	1522.
	45	31165.	29087.	31069.	23137.	36237.	22213.	23897.	24715.	23060.	24072.	24665.	26902.	25795.	26972.	27541.	26392.	27097.	27512.
		3.09	3.89	6.44	13.36	15.53	5.79	5.00	4.66	5.37	4.92	4.68	7.51	5.79	5.00	4.66	5.37	4.92	4.68
		2333.											1732.	1031.	1250.	1368.	1138.	1275.	1362.
Present value with: r=.05		716.8	679.8	804.7	572.8	896.0	584.5	636.4	660.9	612.1	641.3	659.2	729.0	577.5	613.6	630.9	596.6	617.0	629.6
r=.1		374.9	353.0	396.8	290.8	446.1	288.0	312.7	324.3	301.1	315.0	323.5	356.3	299.0	318.0	327.2	309.1	319.9	326.5

Table 9.3

Alternate Estimates of Gross Capital Values of Returns to Specialty Choice No Mortality for r=.05 and r=.10

	V^{U}	V^{ANP}	V^{ANL}	V^{ALP}	V^{ALL}	$V^{G0(1)}$	$V^{G0(2)}$	$V^{G0(3)}$	$V^{G1(1)}$	$V^{G1(2)}$	$V^{G1(3)}$
General/Family Practice	0.0 0.0	-0.0 -0.0	0.0 0.0	0.0 0.0	0.0 0.0	-0.0 -0.0	-0.0 -0.0	-0.0 -0.0	-0.0 -0.0	-0.0 -0.0	-0.0 -0.0
General Surgery	50.5 -16.0	57.3 -9.7	52.0 -14.4	77.4 9.4	66.0 0.5	43.0* -15.7*	46.9* -14.2*	49.6 -13.1	43.4* -15.6*	46.3* -14.5*	43.9 -13.3
Internal Medicine	97.8 35.4	105.6 41.2	106.9 42.0	129.9 59.5	131.7 59.8	103.1 42.7	104.3 42.4	104.7 42.2	103.6 42.6	104.3 42.4	104.6 42.2
Obstetrics/ Gynecology	104.3 25.7	116.6 33.8	121.9 36.3	155.5 59.2	159.9 59.3	108.6 36.0	112.2 35.7	113.5 35.3	110.4 36.0	112.4 35.8	113.5 35.5
Pediatrics/ Pediatric Surgery	-96.6 -64.1	-85.6 -57.2	-89.6 -59.9	-50.6 -35.3	-56.3 -39.9	-88.2* -57.2*	-87.1 -57.0	-86.6 -56.9	-87.8 -57.0	-87.1 -57.0	-86.7 -57.0
Child Psychiatry/ Psychiatry	-94.0 -75.5	-56.7 -54.5	-5.4 -30.1	53.4 6.9	57.8 2.6	-114.7 -73.6	-93.1 -66.1	-83.2 -62.9	-102.7 -69.4	-90.8 -65.3	-83.7 -62.9
Allergy/ Dermatology	-80.3 -64.4	-32.3 -38.3	-33.3 -40.8	105.5 36.1	132.1 42.9	-21.1 -28.5	-24.8 -31.7	-26.7 -33.3	-22.5 -29.7	-24.9 -31.8	-26.3 -33.1
Neur. Surgery/ Orth. Surgery	106.0 22.4	124.2 34.4	116.7 28.2	178.2 69.4	175.4 60.1	142.9 50.4	136.7 45.1	133.7 42.5	140.5 48.3	136.6 45.0	134.2 42.9
Opthamology/ Otolaryngology	2.0 -21.2	40.8 1.1	80.7 20.1	153.2 64.8	175.5 70.3	-1.9 -13.3	14.1 -7.5	21.4 -5.0	6.8 -10.2	15.5 -7.1	20.9 -5.2

Table 9.4

Alternate Estimates of Gross Capital Values
of Returns to Specialty Choice
Physician Mortality
for r=.05 and r=.10

	V^{U}	V^{ANP}	V^{ANL}	V^{ALP}	V^{ALL}	$V^{G0(1)}$	$V^{G0(2)}$	$V^{G0(3)}$	$V^{G1(1)}$	$V^{G1(2)}$	$V^{G1(3)}$
General/Family Practice	0.0 0.0	-0.0 -0.0	0.0 0.0	0.0 0.0	0.0 0.0	-0.0 -0.0	-0.0 -0.0	-0.0 -0.0	-0.0 -0.0	-0.0 -0.0	-0.0 -0.0
General surgery	39.5 -18.2	46.4 -11.9	41.1 -16.6	67.2 7.3	56.2 -1.5	32.7* -17.7*	36.5* -16.2*	39.0 -15.1	33.1* -17.6*	35.9* -16.5*	38.4 -15.3
Internal Medicine	92.3 33.9	100.1 39.7	101.5 40.5	124.5 57.9	126.3 58.2	98.1 41.3	99.1 41.0	99.4 40.7	98.5 41.2	99.1 41.0	99.4 40.8
Obstetrics/ Gynecology	97.4 23.8	109.6 31.8	114.8 34.3	140.0 57.0	152.3 57.0	102.6 34.3	105.8 33.9	107.0 33.5	104.2 34.3	106.0 34.0	107.0 33.7
Pediatrics/ Pediatric Surgery	-94.6 -63.4	-83.9 -56.6	-87.8 -59.3	-49.6 -35.0	-55.3 -39.5	-86.2* -56.5*	-85.2 -56.4	-84.7 -56.3	-85.8 -56.4	-85.2 -56.4	-84.8 -56.4
Child Psychiatry/ Psychiatry	-94.2 -75.3	-58.3 -54.7	-9.5 -30.9	47.7 5.6	50.9 1.0	-112.2 -72.8	-92.1 -65.7	-82.9 -62.6	-101.0 -68.7	-89.9 -64.9	-83.3 -62.6
Allergy/ Dermatology	-79.9 -64.2	-33.7 -38.5	-34.8 -41.1	99.1 34.5	124.0 40.8	-22.5 -28.7	-26.2 +32.0	-28.0 -33.6	-23.8 -29.9	-26.3 -32.0	-27.7 -33.3
Neur. Surgery/ Orth. Surgery	97.5 20.4	115.0 32.2	107.5 26.0	166.7 66.7	162.4 57.1	133.6 48.1	127.5 42.9	124.4 40.2	131.2 46.1	127.3 42.7	124.9 40.7
Opthamology/ Otolaryngology	1.5 -21.6	38.6 0.3	76.6 18.8	146.3 62.8	167.0 67.9	-1.7 -13.4	13.5 -7.9	20.4 -5.5	5.5 -10.5	14.8 -7.5	19.9 -5.7

Table 9.5

Alternate Estimates of Gross Capital Values of Returns to Specialty Choice
Specialty Mortality
for r=.05 and r=.10

	V^{U}	V^{ANP}	V^{ANL}	V^{ALP}	V^{ALL}	$V^{G0(1)}$	$V^{G0(2)}$	$V^{G0(3)}$	$V^{G1(1)}$	$V^{G1(2)}$	$V^{G1(3)}$
General/Family Practice	0.0	-0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	0.0	-0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
General Surgery	48.3	55.3	49.9	76.1	64.9	42.1*	45.8*	48.2	42.5*	45.2*	47.6
	-15.9	-9.6	-14.2	9.6	0.8	-15.2*	-13.8*	-12.7	-15.1*	-14.0*	-12.9
Internal Medicine	102.7	110.5	111.8	134.9	136.6	107.8	109.0	109.5	108.3	109.1	109.4
	36.7	42.6	43.3	60.7	61.1	44.0	43.7	43.5	43.9	43.7	43.5
Obstetrics/ Gynecology	107.3	119.5	124.7	157.8	162.2	111.5	115.0	116.4	113.2	115.2	116.3
	26.5	34.5	37.0	59.7	59.8	36.7	36.4	36.1	36.8	36.5	36.2
Pediatrics/ Pediatric Surgery	-82.2	-71.4	-75.3	-37.3	-42.6	-73.1*	-72.3	-72.0	-72.8	-72.3	-72.1
	-60.1	-53.2	-55.9	-31.7	-36.1	-53.0*	-52.9	-52.9	-52.9	-52.9	-52.9
Child Psychiatry/ Psychiatry	-88.7	-52.9	-3.8	52.6	56.7	-107.0	-87.4	-78.0	-96.5	-85.2	-78.4
	-73.8	-53.2	-29.4	6.9	2.6	-71.6	-64.4	-61.2	-67.5	-63.6	-61.3
Allergy/ Dermatology	-72.2	-26.2	-26.9	105.9	132.6	-15.1	-18.8	-20.6	-16.5	-18.9	-20.3
	-62.1	-36.5	-38.9	36.3	43.1	-26.7	-30.0	-31.6	-27.9	-30.0	-31.3
Neur. Surgery/ Orth. Surgery	109.3	126.8	119.5	178.2	175.1	145.6	139.4	136.3	143.2	139.2	136.8
	23.6	35.4	29.2	69.8	60.5	51.3	46.1	43.4	49.3	45.9	43.9
Opthamology/ Otolaryngology	12.2	49.2	88.0	156.2	179.2	7.0	22.9	30.1	15.6	24.2	29.5
	-18.6	3.3	21.9	65.5	71.2	-11.0	-5.3	-2.8	-8.0	-4.9	-3.1

Table 9.6

Annual Residency Stipends[*]
by Specialty

Year	General Practice	General Surgery	Internal Medicine	OB/GYN	Ped. Surg. Pediatrics	Chd Psy. Psych.	Allergy Derm.	Neur. Orth Surg	Ophth. Otolar.
1936-37	$ ---	$ 588	$ 564	$ 456	$ 468[a]	$ 1128[b]	$ 324[c]	$ 480[d]	$ 396
1940-41	864	564	552	432	420[a]	1092[e]	432[c]	528	384
1945-46	1786	923	960	864	816[a]	1488[e]	780	948	756
1950-51	2211	1200	1536	1232	1077	2630	975	1125	950
1955-56	3074	2041	2496	2161	1810	3508	1655	1764	1620
1960-61	3648	3065	2928	2952	2731	4000	2502	2930	2586
1965-66	6060	4749	4653	4674	4410	5877	4213	4563	4337
1975-76	10894	11845	11711	11535	11474	12559	11996	11952	11637

a--pediatrics only, b--neuropsych., c--dermatology only, d--neurology only, e--psychiatry only

* average beginning stipends for single resident. Source: for years 1936-1956, American Medical Association Annual Report *Medical Education in the United States*, Supplement to the Journal of the American Medical Association. for years 1960-1976, *Directory of Approved Internships and Residencies*, American Medical Association. Values given are unweighted averages of all listed residencies.

Table 9.7

	PRESENT VALUE OF RESIDENCY STIPENDS		GROSS CAPITAL VALUES OF RETURNS TO SPECIALIZATION			NET CAPITAL VALUES OF RETURNS TO SPECIALIZATION UTILIZING GROSS MEASURE		
	TOTAL	EXCESS OVER GENERAL/ FAMILY PRACTICE	$V^{G0(2)}$	V^{ANG}	V^{ALG}	$V^{G0(2)}$	V^{ANG}	V^{ALG}
General/family practice	$21.4	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
General surgery	49.0	27.6	45.8	52.6	70.8	73.4	80.2	98.4
Internal medicine	35.4	14.0	109.0	111.2	135.8	123.0	125.2	149.8
Obstetrics/gynecology	47.8	26.4	115.0	122.1	160.1	141.4	148.5	186.5
Pediatrics/pediatric surgery	34.7	13.3	-72.3	-73.3	-39.8	-59.0	-60.0	-26.5
Psychiatry/child psychiatry	52.0	30.6	-87.4	-29.5	54.8	-56.8	1.1	85.4
Allergy/dermatology	49.7	28.3	-18.8	-26.6	118.6	9.5	1.7	146.9
Neurological/orthopedic surgery	63.5	42.1	139.4	123.2	177.4	181.5	165.3	219.5
Ophthalmology/otolaryngology	48.2	26.8	22.9	67.8	167.7	49.7	94.6	194.5

Table 10.1

ANNUAL ANNUITIES PAID BETWEEN AGES 19 AND 64 EQUIVALENT TO NET CAPITAL VALUES OF PHYSICIAN TRAINING AND RATES OF RETURN TO PHYSICIAN TRAINING

ANNUITIES IN 1976 INCOME DOLLARS
(Internal "income" rate of return)*

		at Lower Bound Schooling Cost		at Upper Bound Schooling Cost		at "Full Cost" Medical School Tuition	
1.	Accountants	$ 6,064	(14.0%)	$ 5,256	(11.0%)	$ 4,251	(9.5%)
2.	Engineers	6,379	(13.5)	5,570	(11.0)	4,565	(9.5)
3.	Lawyers & Judges	1,434	(10.0)	626	(6.5)	-379	(4.5)
4.	Natural Scientists	11,830	(>100)	11,021	(28.0)	10,016	(23.5)
5.	Physicians	0	(0)	0	(0)	0	(0)
6.	Health Technicians	11,570	(16.5)	10,762	(14.0)	9,757	(12.5)
7.	College Faculty	9,940	(>100)	9,132	(23.5)	8,127	(19.0)
8.	Other Teachers	10,481	(19.5)	9,672	(15.5)	8,667	(13.5)
9.	Eng. & Science Technicians	7,789	(12.5)	6,980	(11.0)	5,975	(9.5)
10.	Public Administrators	5,941	(14.0)	5,133	(11.0)	4,128	(9.5)
11.	Bank Officers	6,343	(14.0)	5,534	(11.5)	4,529	(9.5)
12.	Health & Ed. Administrators	6,971	(14.5)	6,169	(11.5)	5,158	(10.0)
13.	Misc. Managers	7,037	(12.0)	6,229	(10.5)	5,224	(9.0)
14.	Trade-Related Managers	7,290	(12.0)	6,482	(10.5)	5,477	(9.0)
15.	Computer & Math Specialists	4,224	(10.5)	3,416	(9.0)	2,411	(7.5)

NOTE: Estimates are based on Table 7.5 net capital values of returns to physician training and assume a five percent interest rate.

* Rates of return to nearest 0.5 percentage point.

Table 10.2

ANNUAL ANNUITIES PAID BETWEEN THE AGES OF 27 AND 71 EQUIVALENT TO NET CAPITAL VALUES OF PHYSICIAN SPECIALIZATION AND RATES OF RETURN TO SPECIALIZATION

	Annuities in 1976 Income Dollars	"Income" Rates of Return
General/Family practice	$ 0	(0%)
General surgery	4,487	(12.5)
Internal medicine	7,032	(40.5)
Obstetrics/gynecology	8,324	(25.0)
Pediatrics/pediatric surgery	-3,388	(-5.0)
Psychiatry/child psychiatry	30	(5.0)
Allergy/dermatology	68	(5.0)
Neurological/orthopedic surgery	9,253	(26.0)
Ophthalmology/otolaryngology	5,294	(20.5)

Note: Estimates are based on Table 9.7 net capital values of returns to physician specialization derived from gross estimate V^{ANG} and assume a five percent income rate of interest.

Rates of return to nearest 0.5 percentage point.

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